Light and Lighting

XXIX.—No. 4. April, 1936 Price 9

THE SCIENCE OF SEEING

Visit the E.L.M.A. Lighting Service Bureau and compare the amount of light your eyes require with the amount of light you are giving them. Means have been provided for demonstrating this new science of seeing to every type of light user, and a mass of statistical evidence has been collected on the all-important subject of the protection of eyesight.

A light meter should be available wherever lighting is under discussion.

Shop Lighting should provide a cheerful and stimulating atmosphere so that goods can be seen easily by both customer and shop assistant.

INCORPORATING "THE ILLUMINATING ENGINEER"

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Incorporating "The Illuminating Engineer."

Light and Lighting

Official Journal of the Illuminating Engineering Society.

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Principal Contents:

Factories Are Supervised —Why Not Offices?

FOR many years factories have been systematically inspected. The conditions are incomparably better than those existing a generation ago. Management and workers both benefit.

It is true that—even to-day—there is no statutory requirement of Adequate Lighting in Factories. But the Home Office Factory Dept. can do and does do a great deal to bring about improvements where necessary.

There is no systematic and routine inspection of Offices.

In the Debate in the House of Commons on the Office Regulation Bill it was complained that almost any ill-lighted, rat-infested basement can be used as an office. (In one case papers stored in a basement became mildewed—so they were moved upstairs and the clerks took their place!)

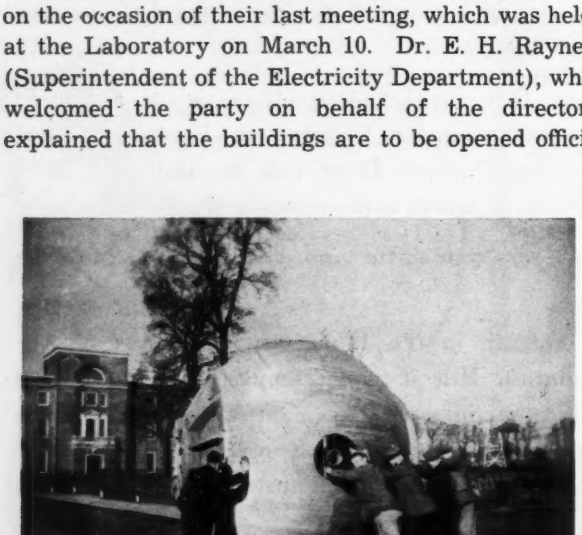
Proper lighting, both natural and artificial, is just as necessary in an office as in a factory, but less likely to be found. When factories are designed lighting is one of the main considerations. The natural lighting of basement rooms used as offices is always poor and the artificial lighting is often miserable.

Factories and Offices should be treated on the same basis.

A Visit to the N.P.L.—Lectures on Illumination—Highway Lighting—A Lighting Code—Lighting for Table Tennis—Floodlighting with Sodium Lamps.

An Informal Visit to the National Physical Laboratory

Although the equipment of the new photometric building at the National Physical Laboratory is still proceeding and the building is not yet regarded as officially open, members of the Illuminating Engineering Society had an opportunity of seeing over it on the occasion of their last meeting, which was held at the Laboratory on March 10. Dr. E. H. Rayner (Superintendent of the Electricity Department), who welcomed the party on behalf of the director, explained that the buildings are to be opened officially in the near future. By that time full particulars of the arrangements will be available and will no doubt be given to members in connection with the detailed version of Dr. Walsh's address to appear in the "Transactions." At this informal "housewarming," however, there was much of interest to be seen, and Dr. Walsh gave an entertaining account of the reconstruction. (The transference of the 10-foot integrating sphere into the new building, illustrated by lantern slides, was evidently something of a job!)



The 10-Foot Integrating Sphere on its way to the Laboratory—A Strenuous Job.

Architectural Lighting in the Laboratory—and Why Not?

Without forestalling the official description we may perhaps say that one important feature in the new building, in which is assembled much photometric work previously scattered under different roofs, is the very long (165 feet) photometric room on the ground floor. This should prove invaluable in testing powerful beams of light. Another interesting piece of equipment is an ingenious and flexible switchboard, which enables a supply from any of the various main supplies or any section of either of the four batteries (now much more handsomely housed than in the past), to be plugged on to any desired circuit. We were also interested to see that, in spite of the somewhat austere aspects of illuminating engineering with which the photometric section of the N.P.L. necessarily deals, aesthetic aspirations found some scope in the "architectural lighting," by means of luminous panels, of certain corridors and staircases, and in the effective floodlighting of the building for the occasion.

Forthcoming Events.

April 7th.—Mr. L. H. McDermott, Mr. W. H. B. Hall and Mr. R. C. Walker on **Applications of Photo-Electric Cells in Illuminating Engineering** (Three Papers) *(General Meeting of the Illuminating Engineering Society, to be held in the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1)*; **6.30 p.m.**

April 28th.—Lt.-Col. Kenelm Edgecumbe on **"Recent Improvements in Integrating and Polar Curve Photometers" (Photo-Electric Pattern),** and Mr. A. R. McGibbon and Mr. P. C. Sugg on **"Photometric Apparatus for Lamp Testing"**; *(Meeting of the Photometry Section of the Illuminating Engineering Society, to be held at the Westminster Technical Institute, Vincent Square, S.W.1)*; **7 p.m.**

May 12th.—The **Annual Meeting** of the Illuminating Engineering Society. After the Presentation of the Annual Report and Accounts, and the Transactions of Formal Business, an **Address** will be delivered by Dr. Merry Cohu (Paris) reviewing **Progress in Illuminating Engineering in France.** *(At the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1)*; **7 for 7.30 p.m.**

Lecture on Illumination at the Northampton Polytechnic Institute

Mr. H. S. Barlow, M.Sc., known to our readers as the author of a useful recent paper before the Illuminating Engineering Society, was responsible for a very effective demonstration at the annual conversazione of the Northampton Institute.

In his recent lecture there he appeared as instructor and entertainer of 300 or 400 children drawn from primary and central schools in the Clerkenwell region.

This provides a type of opportunity which is too often missing in their experience, and their delight, made very obvious to an observer in a vantage point near the lecture-table, was confirmed in the almost wild enthusiasm of their greetings at the end. But with all this there was real intelligence and attention, proof of which came when a question framed to test their understanding of the inverse square law was answered correctly by a large number after one or two hasty boys had made thoughtless shots!

The lecture opened with a historical account of the progress of filament lamps and bulb glass, and a series of examples and working models illustrated the principle of photometry, elementary ideas of glare, colour properties, eye accommodation, and the absorption due to wall areas and their colour selectivity.

In simple language Mr. Barlow then explained the fundamental identity of "wireless waves," light, X-rays, etc., and gradually made very real by progressive experiments the existence and properties of ultra-violet and infra-red rays; fluorescent powders were shown under visible and invisible radiation, and large pictures painted with fluorescent materials underwent colour changes or were made brilliantly visible when ordinary light showed little or nothing. Some examples were designed to show the possibilities of applications to advertisement. There were modern experimental tubes and other devices illustrating the opacity of special glasses to ultra-violet, the "positioning" of the glow by means of a magnetic field and the stroboscopic effect, a very popular exhibit being a model of a telephone kiosk containing a lamp arranged to be extinguished when "daylight" came outside. An infra-red detector was operated by a boy who obviously experienced an unethical thrill of delight at being used as a burglar to make a bell ring when he walked in front of the distant source of invisible rays.

Such a lecture would not only be a valuable stimulus to similar groups of children elsewhere but, with little modification, would do useful service to good illumination, and the experts responsible for it if delivered to the right kind of adult audience.

Valuable apparatus was kindly lent from Research Laboratories of the B.T.H. (Mr. L. J. Davies) and the G.E.C. (Mr. C. C. Paterson). Dr. Leonard Levy also provided very interesting exhibits and there were also important loans from the following:—Mek-Elek Engineering, Ltd. (Mr. H. C. Cooper); Radio-Visor Parent, Ltd. (Mr. J. W. E. Avern); Strand Electric and Engineering Co., Ltd.

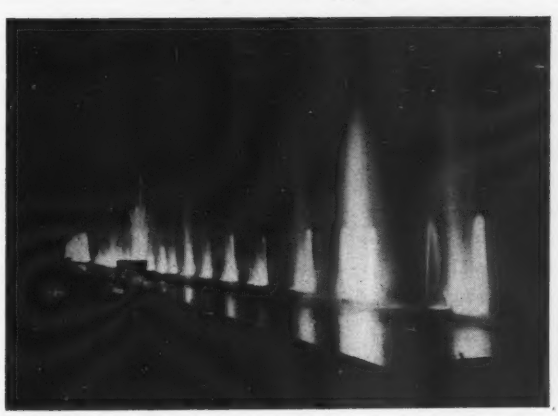
Mr. Barlow has asked us to express his grateful appreciation of all the interest and trouble taken by these firms and the experts who helped him.

"Highway" Lighting in Edmonton

The above illustration relates to Silver-street, the eastern outlet of the North Circular-road, which now carries a very heavy volume of traffic. The North Metropolitan Electric Power Supply Company, with whose permission this photograph is reproduced, has installed thirty-three "Highway" fittings furnished by Engineering and Lighting Equipment Co., Ltd. These units were required to meet somewhat unusual conditions. Owing to a culvert running underneath the pavement it was found impossible to get the necessary foundations for the posts in certain positions. It was, therefore, necessary to arrange for the fittings to be installed on one side of the road only. From this standpoint the adjustability of the fittings adopted proved a great advantage, as they enabled even illumination to be obtained over the whole width of the road in spite of the use of a "unilateral" system of lighting.

"Amber" Period too Short?

It is stated that the variation in the length of time for which the amber light is shown on traffic signals throughout the country has been causing trouble to motorists. There appears to be no standard practice, and in some cases the period before the red light appears has proved to be insufficient—with the result that only by dangerous braking can a driver pull up in time. The R.A.C. has accordingly suggested to the Ministry of Transport that there should be a uniform minimum period during which the amber light must be shown.



The "Street of 100 Fountains," in the park of the Museum of Hygiene, Dresden, which has a striking appearance when floodlighted by night.

A Lighting Code

A "Lighting Code"—a list of recommended values of illumination for various purposes—was issued by the Illuminating Engineering Society in the third number of their "Transactions" (March, 1936). We give below the main classification. Supplementary data enabling the illumination requisite for various buildings and trades are added in this issue of the "Transactions," which has been already circulated to members, but is obtainable by others on application to the Society at the cost of 6d. a copy.

	Recommended Foot-candle Value.	Class of Task.
1.	**Above 50**	Precision work to a high degree of accuracy; tasks requiring rapid discrimination and response, displays.
2.	**25—50**	Severe and prolonged visual tasks, such as fine engraving, sewing of dark goods, and discrimination or inspection of fine details of low contrast.
3.	**15—25**	Prolonged critical visual tasks, such as proof-reading, type-setting, drawing, reading, fine machine work, fine assembling, sewing on dark goods, large stores.
4.	**8—15**	Visual tasks such as detailed office work, skilled bench-work, and sewing on light goods, retail shops.
5.	**5—10**	Less exacting visual tasks, such as general office, large assembly work, class-rooms.
6.	**3— 5**	Work of simple character not involving close attention of fine details.
7.	**2— 4**	Casual observation where no specific work is performed.

Light and Type

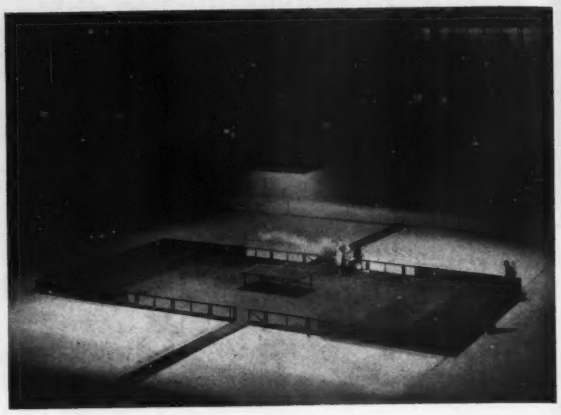
In a booklet issued by the National Society for the Prevention of Blindness (U.S.A.) Dr. M. Luckiesh tabulates values of illumination for various kinds of reading matter. Assuming 7 foot-candles on 10-point type (in which this journal is mainly printed) 10 foot-candles is regarded as necessary for 8-point type (as used under "The Editor Replies").

Other suggestions for equal ease of vision are:—

Handwriting with pencil, 25 ft.-c.; newspaper text matter, 35 ft.-c.; yellow pages of telephone directory, 50 ft.-c.; shorthand notes with pencil, 60 ft.-c.; newspaper stock quotations, 75 ft.-c.

On this basis 10-20 foot-candles have been recommended for ordinary reading when not prolonged, and 20-50 foot-candles for reading when moderately critical and prolonged.

Lighting for Table Tennis



The illustration above shows the illumination of the table and the surrounding area in the Earls Court Stadium on which the recent table tennis championships were played. The large central fitting, which is of special G.E.C. design, is lowered from the roof by winch operation.

Light and Air

Engineers have learned to dig, burrow, and bore to an extent that makes the manufacture and distribution of artificial light and air into twin industries of increasing magnitude. The electrical industry is already heavily indebted to architectural planning . . . . Contemporary or so-called modern architecture is largely a matter of providing artificial light and air as agreeable substitutes for what God made.

(*Mr. Oliver P. Bernard at the E.L.M.A. Architects' Conference.*)

New Buildings in Whitehall

A start will be made in June with the new block of buildings to replace the present accommodation for Government Departments in Whitehall Gardens The cost will approach £2,000,000. The Ministry of Transport will be amongst the first to be affected.

Floodlighting with Sodium Lamps

The Clock Garage, the latest and most up-to-date garage in Manchester, has recently been floodlighted by seven 150 watt "Phillora" sodium electric discharge lamps in "Wardle" Solux floodlight projectors. The height of the building is approximately 50 ft., and the length 150 ft. The photograph, which gives a good idea of the effect obtained, was taken immediately after a heavy shower of rain.

The Lighting of a Modern Fish Dock

by

A. G. Brown, A.C.G.I., and

A. L. Whittenham, A.M.IE.E.

This description of the lighting of the recently extended Fish Dock at Grimsby —stated to be the largest of its kind in the world — formed the subject of a paper presented at a meeting of the North-Western Area (Local Section) of the Illuminating Engineering Society held in Manchester on March 17th, 1936.

Fig. 1. A bird's-eye view of the world's most modern Fish Dock at Grimsby; in the far distance the extensions opened in 1934 are visible.

Introduction.

As a preliminary to a description of the lighting of this new fish dock at Grimsby a brief description of the layout and the purposes served by the various sections may be useful. A bird's-eye view of the entire dock is presented in Fig. 1 and a plan of the new dock (opened in 1934) in Fig. 2. This comprises a new quay 2,000 ft. long, three new coaling jetties, each equipped with a mechanical coal-handling plant, three new slipways with electrically driven winches, two outfitting jetties with travelling cranes, and a railway siding comprising twenty-six miles of lines.

Fishing trawlers form the major part of the 600-700 vessels registered at Grimsby. On an average 600 tons of fish are landed each day, and sometimes as many as 100 vessels enter during a period of 1½ hours.

In order that this enormous tonnage of fish may be brought in and rapidly distributed considerable activity during the hours of darkness is necessary. Trawlers enter and leave at variable hours during the night and early morning, and for economic reasons the time spent in port, which is unremunerative, should be reduced to a minimum. Cargoes must be unloaded, bunkers filled with coal, and any necessary repairs executed as speedily as possible.

For all these reasons an adequate system of artificial lighting is of first-rate importance.

Different classes of work are segregated in different parts of the dock. (If coaling and outfitting were performed where the fish is unloaded the fish would certainly suffer.) Trawlers are therefore frequently manoeuvring within dock and the lighting system was planned to meet this condition by screening all light sources which might dazzle pilots in the dark areas between the quays.

Let us now proceed to a description of the lighting.

(We are indebted to the General Electric Co. Ltd., for the complete series of illustrations accompanying the above description.—Ed.)

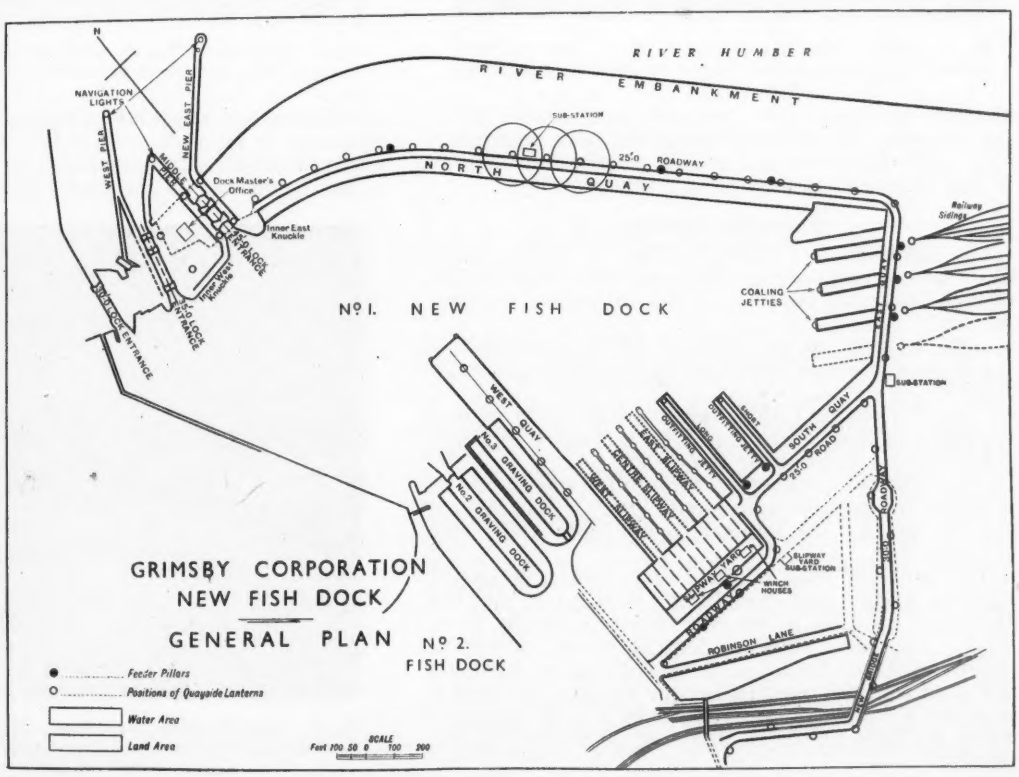


Fig. 2. The first dock at Grimsby was opened in 1856. In 1876 a second dock was built. The third and last dock was commenced in 1930, and opened in 1934. In the adjacent plan the details of the new Fish Dock are shown. The Locks, the North Quay, the Coaling Jetties and the Slipways all require special lighting. This new dock adds a water area of 37 acres, making a total of 66 acres. The new quay is 2,000 ft. long.

Navigation Lights and Lock Entrances.

To enter the dock trawlers have to pass through a narrow channel and then through one of two "lock-pits." At night there are many lights along the shore, so that the pilot requires easily distinguishable navigation lights to keep him on his correct course and prevent him from running ashore. For this purpose miniature lighthouses are employed, which flash on and off to a definite time cycle. Some of these signal lights are red and others white, some only provide light in a specified sector, but all have a range of approximately 1½ miles. The maximum candle-power from these lanterns is directed in the horizontal plane by means of prismatic glass refractors. Fig. 3 illustrates the assembly.

Once the trawler has passed through these lights and the lockpit into the dock the pilot sees two ribbons of light, one to starboard and the other to port. These are the long quays used respectively for unloading the fish and the disembarkation of the crew. Straight ahead other signal lights consisting of red units which indicate outfitting jetties and the slipway dolphins are visible; three blue units indicating the coaling jetties. These signal lights are mounted on 10 feet steel posts at the extremities of the jetties. There are two others, green in colour,

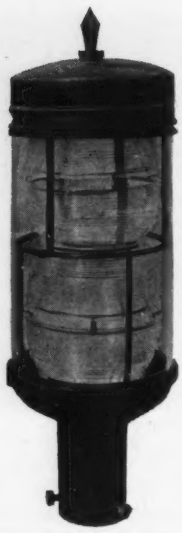


Fig. 3. These Navigation Lights were specially designed for Grimsby. Two standard lamps are used in each lantern in order to minimise the possibility of a complete "black-out" due to lamp failure. Attention may be drawn to the special method adopted of supporting the housing without obstruction of light in any part of the 360° sector. The units are entirely enclosed and dust proof.

The polar curve of its light distribution and that of a bare lamp is given in Fig. 8. This shows that one effect of the special reflector is to increase the intensity of light to seven times the bare lamp value

Fig. 4. North Quay, looking west, by day. 500-watt dock lighting lanterns, on concrete bracket and pole, are seen at the edge of the track.

Fig. 5. North Quay, looking west, by night. The effect of the 500-watt lanterns, mounted 35 ft. above roadway, is well displayed.

mounted on 15 feet steel masts on the bullnoses forming the exit. All are low power units, each employing only a 60-watt lamp and are of construction similar to that of an ordinary ship's side light.

Quayside Lighting.

The lighting of the quays called for more skilful illuminating engineering than any other part of the dock. This was because of the following requirements:

(a) A uniform intensity of approximately half a foot-candle was required on a long and narrow area;

(b) No visible bright light sources could be employed as their glare would be a menace to pilots both inside and outside the dock;

(c) The total current consumption was to be the minimum possible consistent with satisfactory results, because the lights burn all night and every night.

The problem was, in fact, very similar to street lighting, except that more light was required and the light sources had to be completely screened from view. The same problem has, of course, arisen at other important docks and a special lantern has been designed for such uses. Its unique features are that it provides uniform illumination over a wide area and emits no light above an angle of 70 degrees to the vertical.

at an important angle and, further, that the maximum intensity is emitted only a few degrees below the angle of cut-off. In essentials the lantern comprises a mathematically designed silver glass reflector

Fig. 6. Lock Entrance—night view. Illuminated by 500-watt Dock lighting lanterns, on spun concrete poles with raising and lowering gear.

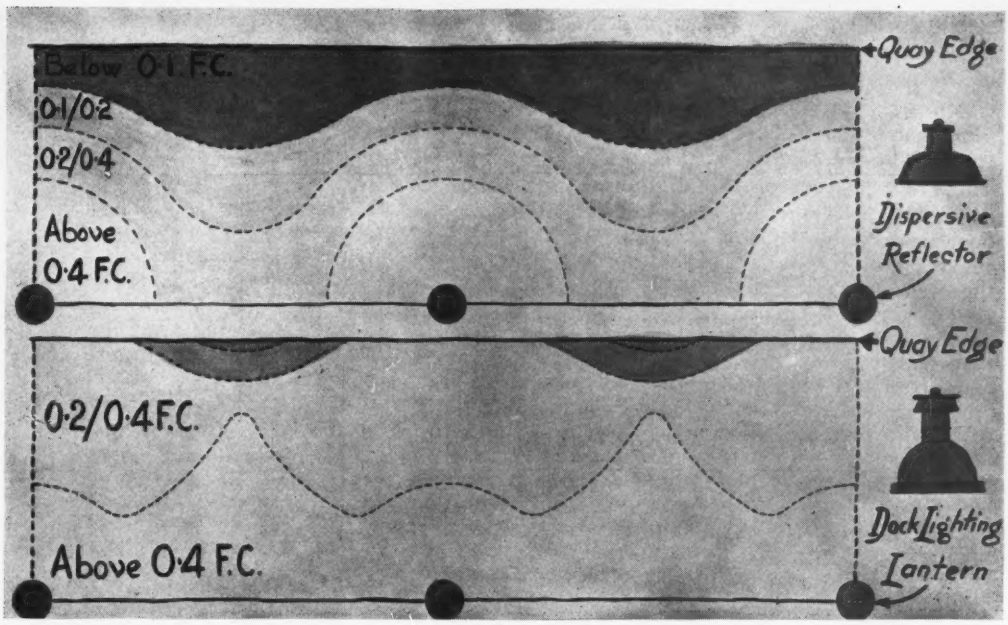


Fig. 7. These two diagrammatic plans of the quay show one advantage of the special dock lantern over a white vitreous enamelled reflector (B.S.S. type). Illumination values are in foot-candles.

housed in a non-ferrous metal body. Each lantern accommodates one 500-watt metal filament lamp. Due to their light cut-off requirement, the arrangement of the lanterns along the quay side was very critical. It was necessary first to calculate the mounting height by consideration of the illumination required and then to select the correct positions completely to illuminate the whole of the area.

The results obtained from this arrangement can be seen in Figs. 4, 5 and 7. Perhaps it is interesting to note that the poles supporting the lanterns are made from spun concrete fitted with concrete bracket arms. These were considered to be more durable than tubular steel or timber and to require much less maintenance.

Coaling Plant Lighting.

In order to describe the artificial lighting system employed on the coaling plants, of which there are three at Grimsby, it is necessary to explain the design and operation of the plant. This can be seen from Fig. 9. It consists essentially of a lattice steel tower 90 ft. high supporting two cantilever arms. The tower is placed in the centre of a jetty so that ships can be moored on either side with the cantilever arms projecting over them and clear of their masts and funnels.

In the majority of the steam trawlers using the Grimsby dock the coal has to be stowed through circular manholes on the port and starboard decks, and unfortunately this does not facilitate quick coaling by mechanical methods. However, the designers of the coaling plant found that it was possible to feed coal through the manholes in the deck by means of mechanically operated buckets or skips, which could be swung out directly over decks and then opened at the bottom. Accordingly, there are four mechani-

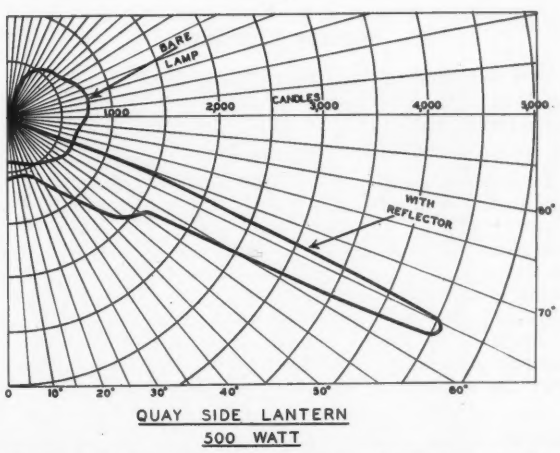


Fig. 8. Polar Curve showing comparative distributions of light with and without the reflectors as installed.

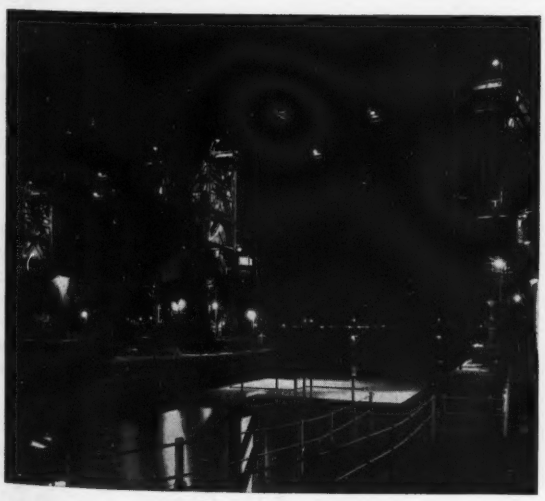


Fig. 9. Coaling Appliances by Night. 500 and 150-watt marine type floodlights.

cally operated buckets to each of the coaling plants; each is fed by a belt conveyor when it is on the jetty and then hauled up, traversed along the cantilever arm over the ship and lowered to within a few feet of the deck, and the bottom opened. One man operates the movements of each bucket and is stationed in one of the four control cabins half-way up the tower. Each operator has control of his own set of lights. Obviously, it is necessary that these operators should be able to see clearly the exact position of the manholes in the deck and of all the superstructure on the deck, such as the bridge and funnel, over which the buckets are manipulated. It is also necessary that they shall discern the black coal buckets when they are in their highest positions. To meet these requirements four floodlights were installed on each of the cantilever arms, two at the extremity and two adjacent to the tower. These were mounted on universal brackets and project a relatively narrow beam almost vertically downward on

to the decks of the trawlers. The exact positions of these floodlights were determined by consideration of the possible means of access for relamping and cleaning. In addition to these powerful floodlights others employing 150-watt lamps were fixed on the roof and under the floor of each of the control cabins. Those on the roof project light upwards so as to illuminate the travelling trolley, and those under the floor project light downwards into each of the four buckets, where they are fed by belt conveyors. Since the operator in the cabin has to stop the belt conveyor when the bucket is full, a high intensity of illumination is necessary in these positions.

Special marine type floodlights were employed. These of necessity had to be very robust and durable in order to resist the severe conditions under which they were to work. In addition to the brine-laden sea atmosphere, they had to resist the chemically active fumes coming from the trawler funnels and also be impervious to coal dust. Accordingly, they were constructed with a special aluminium alloy body and fitted inside with a silvered glass parabolic reflector and made totally enclosed and dustproof with " armour plate " front glass. A rough idea of the effectiveness of this floodlighting system will be gained from Figs. 9 and 10.

There is one feature of considerable importance about this floodlighting system. Although there are sixteen floodlights on each of the coaling plants, the pilot of a trawler berthing his ship at the jetty does not experience any glare because all the light is projected in approximately parallel beams vertically upwards or vertically downwards, and the candle-power in the horizontal plane which would cause glare is practically nil.

Slipway Lighting.

The slipways at Grimsby are provided with such a lighting system that a 600-ton trawler can be hauled completely out of the water at night and repair work on its hull effected.

In the layout of the lighting system a compromise had to be adopted because it was found impossible to support the light source in what would have been the ideal positions. The winch houses at the top provided the only possible positions for fixed lighting units, because all the remainder of the space was required for the movement of the ships. However, in addition to the fixed permanent lights, watertight electric sockets were provided in the concrete slipway for connecting portable inspection lamps.

The permanent lighting is provided by 200-watt narrow beam floodlights fixed on the brick winch houses or reinforced concrete poles 14 ft. high at the top of the slipway, and they project the light straight down the slip towards the water between each of the ten berths for trawlers.

Railway Sidings.

The problem of lighting railway sidings is one which continually confronts the illuminating engineer. Obviously, there is no difficulty in pouring a large quantity of light more or less evenly over a large area, such as a group of railway tracks, but the real problem is to light this vast area by a system with a low power consumption, and requiring the minimum of maintenance. In addition, the capital cost of the system has of necessity to be kept to a minimum consistent with satisfactory results.

The lighting method employed on the L.N.E.R. railway sidings at Grimsby follows the principle which has found favour both in this country and abroad. This makes use of powerful narrow beam floodlights mounted in groups on poles approximately 50 ft. high.

Fig. 10. Trawler alongside Coaling appliance showing lighting on deck by 500-watt Marine type floodlights on Cantilever arm.

The authors agree that this system has disadvantages, and would be pleased to hear of a more satisfactory method, but it is the most desirable method to meet the existing conditions, and it can claim the following advantages:—

(1) The lighting units can be placed in groups spaced, roughly, a quarter of a mile apart; this keeps the capital cost of cabling to a minimum.

(2) The maintenance cost, which comprises cleaning and relamping, is kept to a minimum, since a few high-powered units require less maintenance than a larger number of lower-powered units.

(3) The obstruction caused by posts supporting the lighting units is kept to a minimum.

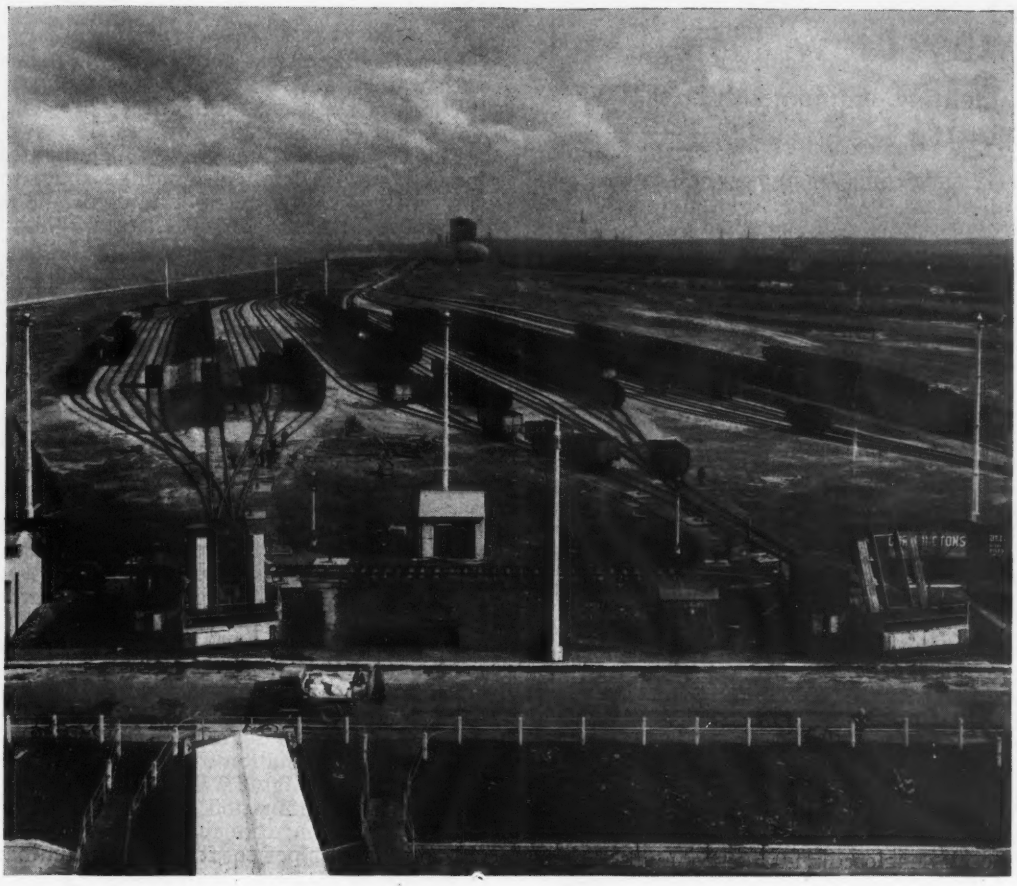
(4) Any inconvenience due to glare is as far as possible minimised by the height at which the units are mounted.

(5) The overall lighting efficiency is high; in other words, the ratio of the light provided at the sources to the light reaching the working plane is high.

In the foregoing, most technical details have intentionally been omitted because it is felt that the reasons for and reference to the types of lighting systems employed are more important than the ways in which the different systems have been applied. Data lists containing more precise details are appended.

An important factor in the design of this installation was the collaboration between the lighting and the electrical engineers, which ensured correct electric supply and good control of the various and scattered units. The voltage drop in supply cables were calculated. Indicators were provided in the Dock Master's Office to show when the main navigation lights were operating.

In conclusion the authors expressed their acknowledgments to Sir John Wolfe Barry and Partners, the consultant engineers, the London and North-Eastern Railway, the Directors of the General Electric Co., Ltd., and Mr. T. E. Ritchie for permission to publish this information.



Railway sidings from top of coaling appliance—(Day view). Special 1,000-watt floodlights on spun concrete poles fitted with permanent ladders.

Railway sidings from top of coaling appliance—(Night view). Showing effect of 1,000-watt floodlights 45 ft. above ground.

Grimsby New Fish Dock

Lighting Equipment Data

Navigation Lights.

Type 1.—Visible range, nominally 1½ miles minimum.

Method of support: Tubular steel poles 24 feet high, bolted down with flange plate to timber decking.

Lamps: Two standard 150-watt clear glass tungsten filament lamps (wired in parallel) in each lantern.

Optical control: Four prismatic glass refractors designed to produce a high intensity in the horizontal plane.

Candle-power in horizontal plane from one lantern providing white light, 1,060 candles.

Candle-power in horizontal plane from one lantern providing red light, 160 candles.

Lanterns constructed mainly in non-ferrous metal and designed to be totally enclosed and dustproof.

Quantity of units installed, 2 white, 3 red.

Maintenance method: By steel ladder permanently fixed to pole.

Type 2.—Visible range: Nominally 700 yards.

Method of support: Tubular steel poles 11 feet high, bolted down with flange plate on timber jetties.

Lamps: One standard 60-watt pearl tungsten filament lamp.

Optical control: White interior reflector and coloured front glass.

Candle-power in horizontal plane from one lantern providing red light, 7 candles; green light, 9 candles; blue light, 2½ candles.

Lanterns constructed in heavy gauge sheet copper and made totally enclosed and dustproof.

Quantity of units installed, 6 red, 5 blue, 2 green.

Maintenance method: By steel ladder permanently fixed to the pole.

Quayside Lighting Units.

Average spacing of lanterns, 120 feet.

Distance from edge of quay, 73 feet.

Mounting height, 35 feet ground to light source.

Method of support: Spun concrete poles with steel reinforcement, 44 feet long overall, with concrete brackets projecting 3 feet 6 inches and with a door in the base giving access to switches, etc.

Lamps: One standard 500-watt tungsten filament in each lantern.

Optical control: Special silvered glass reflector.

Angle of light cut-off: 71 degrees to the vertical.

Maximum candle-power: 4,600 candles.

Maximum horizontal illumination on ground, 0.6 foot-candles; minimum, 0.1 foot-candles.

Lanterns constructed from heavy gauge copper.

Quantity of units installed: 43.

Maintenance method: By tower-wagon from quayside roadway.

Raising and lowering gear at lock entrance.

Coaling Plant Lighting.

Height of floodlights above deck of trawler 64 feet.

Lamps: Some 500-watt, others 150-watt standard tungsten filament.

Optical control: Parabolic silvered glass reflectors.

Marine type floodlights constructed in cast aluminium alloy, with "armour plate" front, glass, totally enclosed and dustproof, mounted on brackets specially designed to facilitate lamp replacement without disturbing correct alignment.

Maximum candle-power: 500-watt, 20,000 candles; 150-watt, 5,000 candles.

Beam angles: 30 degrees total (in both cases).

Average horizontal illumination on deck of trawler, 6 foot-candles.

Quantity of units installed: 24 500-watt, 24 150-watt.

Maintenance method: By ladders provided in steel structure.

Slipway Lighting.

Length of slipway above water: 170 feet (varies with water level).

Width of slipway: 400 feet.

Number of berths for trawlers: 10.

Floodlights fixed on brick winch houses or reinforced concrete poles, 14 feet high above top of slipway, all projecting straight towards the water.

Lamps: Standard 200-watt clear glass tungsten filament.

Optical control: Parabolic silvered glass reflectors.

Maximum candle-power: 7,500.

Beam angle: 30 degrees total.

Floodlights constructed in spun copper with heat-resisting front glass, focusing gear and universally adjustable bracket.

Quantity of units installed: 11 (one each side of each berth).

Maintenance method: By steel ladder permanently fixed to concrete pole.

Railway Sidings.

Floodlights arranged in groups flooding in both directions along the lines.

Distance between each group: 370 yards.

Height of floodlights above ground: 45 feet.

Lamps: Standard 1,000-watt tungsten filament.

Optical control: Parabolic silvered glass reflector.

Maximum candle-power from one floodlight: 84,000 candles.

Beam spread: 28 degrees total.

Average illumination at mid-span on vertical surface facing floodlights: 0.42 foot-candles.

Measured illumination at mid-span, on horizontal surface: 0.06 and 0.10 foot-candles.

Lamp lumens per sq. ft. of area illuminated: 0.45.

Method of support: Spun concrete poles with steel reinforcement 50 feet long overall, fitted at the top with a concrete platform, and with a door in the base for switches, etc.

Floodlights constructed with cast aluminium alloy body, heat-resisting front glass; special daylight focusing gear, universal bracket specially designed to facilitate lamp replacement without disturbing correct alignment, and being totally enclosed and dustproof.

Quantity of units installed: 17 floodlights, 13 poles.

Maintenance method: Steel ladders with safety guard at top, permanently fixed to each pole.

Pier Lighting Units.

Width of pier: 20 feet.

Average spacing of lanterns: 100 feet.

Lanterns arranged over centre line of pier.

Mounting height: 15 feet deck to light source.

Method of support: Tubular steel poles with flange plate bolting down on to wood decking.

Lamps: Standard 100-watt clear tungsten filament.

Optical control: Special silvered glass reflectors similar to the larger units on the quayside.

Angle of light cut-off: 71 degrees from the vertical.

Lanterns constructed with spun copper body.

Maintenance method: By steel ladders permanently fixed to poles.

Outfitting Jetty Lighting.

The two jetties are completely traversed by 15-ton and 5-ton movable electric cranes.

Length of jetties: 398 feet and 268 feet.

Width: 41 feet.

Both illuminated by a floodlight at each end.

Mounting height: 45 feet.

Lamps: One standard 500-watt tungsten filament.

Method of support: Tubular steel pole 44 feet high, with steel flange plate bolted on concrete decking, and spun concrete pole 44 feet high on quayside.

Floodlights identical with railway siding units.

Quantity of units: 4 floodlights, 2 steel pole, 2 concrete poles.

Maintenance method: Steel ladders permanently fixed to poles.

EVERYDAY PHOTOMETRY

(II) The Cosine (Lambert's) Law

Just as some confusion of mind in regard to the validity of the inverse square law exists—as we have seen—so, too, one finds that people occasionally declare that "the Cosine Law is not true in practice."

If by the Cosine Law (which is sometimes termed "Lambert's Law") is meant the fundamental relation in regard to the illumination received by an inclined surface, then undoubtedly this is just as definite and universal as the inverse square law has been shown to be. Properly understood, the Cosine Law merely states that the illumination of the surface is proportional to the cosine of the angle at which the light strikes this surface.

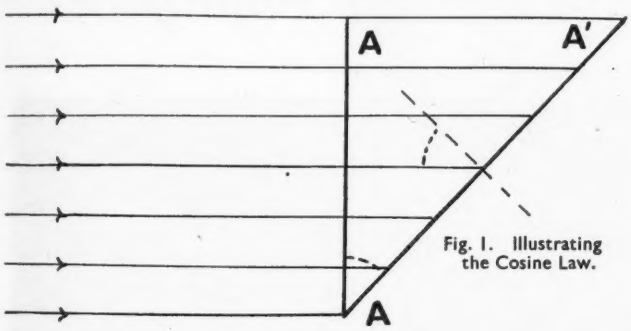


Fig. 1. Illustrating the Cosine Law.

Suppose, for example, we insert a surface in the path of parallel beams of light so that the rays are intercepted on the line A A (Fig. 1), which is perpendicular to the direction of the light, then the illumination is a maximum. If now the surface is tilted backwards at some angle (θ ,say), the beam of light is now spread over a larger area, corresponding to A A^1.

The illumination is then reduced in the proportion A A/A A^1, which is cos θ (the angle between A A and A A^1, and also, of course, the angle between lines perpendicular to both).

The Brightness of a Surface.

The illumination received by any surface will thus be greatest when the surface is perpendicular to the direction of the light, and for any other position will be less to an extent proportional to the angle at which the light is received.

What happens after the light reaches the surface, i.e., how the *brightness* of the surface is affected, is another matter.

Let us assume, first, that we are dealing with a rough matt diffusing surface. If this surface is *dead matt*, i.e., if it is a perfect diffuser, then the brightness should remain the same whatever be the angle from which it is viewed and whatever the direction from which the light comes. The light is then scattered in the manner indicated in the right-hand sketch of Fig. 2. The brightness is constant, and its value depends simply on the reflecting power of the material. A carefully prepared surface of magnesium carbonate, besides approaching closely to ideal diffusion, is said to have a reflection factor of approximately 98 per cent., but the most familiar example of a relatively light material is white blotting paper, the reflecting power of which is of the order of 80-90 per cent. Very dark cloth may have a reflecting factor of 2-5 per cent., and black velvet even less.

In illuminating engineering it is usually a considerable advantage to work with a material which is substantially matt, as well as of good reflecting value. The brightness can then be inferred with certainty from the illumination, which in turn can be accurately calculated.

For photometric surfaces used in the laboratory (such as the magnesia screen of the Lummer Brodhun Photometer) good white diffusing materials are selected. A slight departure from the ideal is not usually of great moment, as they are usually placed in a position perpendicular to the light rays, where the error arising from a slight obliquity is small.

Photometric Test Plates.

But in the case of illumination photometers, which are frequently used in circumstances such that light strikes the test-surface at quite oblique angles, a material departure from the ideal diffusing surface may occasion serious errors.

This applies particularly to street lighting, where sources are far apart so that the angle at which light from them strikes the photometric surface may be very oblique. This leads to error in two ways: Firstly, because a small error in measuring such

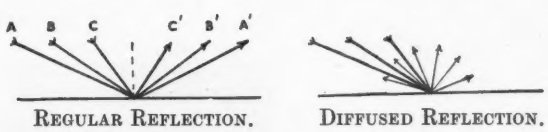


Fig. 2. When Regular Reflection occurs at a polished surface all the light from rays A, B and C is reflected in directions A′, B′, C′ respectively. When Diffused Reflection occurs at a matt surface each ray is broken up, and reflected light is scattered in all directions.

angles produces proportionately a large error in the cosine of the angle, on which the illumination depends; secondly, because any departure on the part of the surface from ideal diffusing qualities becomes most marked when the light strikes them at very oblique angles. Even in the case of interior lighting a considerable departure from the ideal diffusing test-surface may have some effect; for example, if installations of direct lighting and indirect lighting are compared. One difficulty in connection with photo-electric photometers, largely overcome in the most recent models, has been that the surface was either itself partially polished or protected by a reflecting film, so that with glancing light the intensity might not be correctly measured.

The nature of diffused reflection is indicated in Fig. 2, where, on the right, each ray striking the surface returns as scattered light equally distributed in all directions irrespective of the angle of incidence. There is no definite "angle of reflection."

Regular Reflection.

Regular reflection, on the other hand, as indicated on the left in Fig. 2, results in light being reflected in accordance with the familiar law that the angle of incidence of the light must equal the angle of reflection. With certain surfaces, such as polished silver, a high percentage of light is reflected. On looking at such a surface one sees, by reflection, merely the source of light, and that at one particular angle only.

The types of surfaces most frequently met with in illuminating engineering combine in varying degree both forms of reflection. Some reflectors have a highly polished inner surface, and operate almost entirely by regular reflection. Others, for example those internally treated with aluminium paint, have an effect which is partly diffusing and partly directive. Advantage is taken of this quality of frosted aluminium surfaces for cinema screens. Surfaces which have some degree of glaze superimposed on a dead white ground also combine direct regular and diffused reflection.

A Standard of Gloss?

There is no established basis of measuring and specifying "gloss" in illuminating engineering. This is a matter which is at present being studied. But almost all apparently dead white surfaces have some degree of gloss. Most paints dry with a more or less glossy surface, and their brightness, when observed from different directions, therefore varies considerably.

In interior lighting the quality of the surface is of some moment. The presence of gloss leads to reflections of lamps or globes, which are often unsightly and may give risk to glare. In the case of ceilings, cornices, etc., it may also result in the brightness of certain parts being less than that suggested by predeterminations based on the cosine law.

What Happens in the Streets.

In street lighting the existence of gloss or polish becomes evident in an acute form. Modern surfacing materials are usually dark in colour, and in any case soon become highly polished by the wheels of motor cars. Hence, the appearance of a street surface may, according to the angle from which it is viewed and the apparent distribution of brightness at some given angle, bear little relation to curves showing predetermined values of illumination throughout the length of the street. The appearance of such a road surface, especially in wet weather, may depend more on the positions of reflections of street lamps than on the distribution of illumination, and this is taken into account in modern methods of public lighting.

Floodlighting Car Parks and Hotel Approaches

Fig. 1. This striking picture shows the floodlighting of the car park of the Billesley Hotel, King's Heath, Birmingham, by means of Benjamin Duoflux Floodlights, with which either standard gasfilled (filament) lamps or electric discharge lamps may be used. The picture illustrates how large an area can be lighted by quite a few projectors. This photograph was reproduced, by permission of Messrs. Holt's Brewery, of Birmingham, the proprietors of the Billesley Hotel, in a recent issue of *The Reflector*.

Much has been written about the need for good lighting in hotels. We all know how unfavourable is the impression left by dim and sombre lounges and bedrooms without a comfortable bedside lamp. But nowadays the duty of the hotel proprietor is not confined to the interior—the approaches should be well lighted so as to guide the steps (or wheels) of arriving and departing guests. Floodlighting, too, is becoming quite a usual feature. The above illustration emphasises one most important point—the provision of ample lighting for the area in which cars are parked—and the picture on the next page shows the value of special road lighting in front of the hotel.

Fig. 2. A view of the road lighting in front of the Billesley Hotel, King's Heath, Birmingham, mentioned in the previous page. The method of lighting is similar to that adopted for the car park adjacent to this hotel, which is illustrated in Fig. 1. The value of such additional lighting in "welcoming the coming, speeeding the parting guest" is evident.

FLUORESCENT SCREENS

For Cathode-Ray Tubes and Television

The paper read on the above subject by Dr. Leonard Levy and Mr. D. W. West before the Institution of Electrical Engineers on March 4, forms an interesting supplement to Mr. Lamplough's recent address to the Illuminating Engineering Society.*

The distinction between "phosphorescence" and "fluorescence" is recalled. The authors are chiefly concerned with apparatus in which phosphorescence (the lingering of light after the stimulus ceases) is a definite drawback, such as screens for X-Ray work. The use of zinc sulphide for such screens is desirable on account of the high brightness attained, but it is necessary to eliminate completely the after-glow. This can be done by adding a "killer." Nickel is the only substance that appears to act in this way, and only a minute proportion—one part in one or two million—is necessary.

Some substances, such as calcium tungstate and cadmium tungstate show maximum luminescence when they are perfectly pure; others, such as zinc sulphide, silicate, and phosphate, show little luminescence unless a "phosphorogen" is present. Here, again, a relatively small quantity, only 1 in 10,000 or 1 in 100,000 is needed.

The authors showed interesting curves illustrating the relation between candle-power and voltage of cathode tubes. A mixture of zinc sulphide and zinc cadmium sulphide (which the authors denote by "Z.23"), gives the most brilliant effect, the fluorescence being white—a very desirable quality in television. Zinc sulphides can be prepared to maintain fluorescence unimpaired during the average life of a cathode ray tube, which should be in excess of 1,000 hours.

The efficiency of luminescence of fluorescent bodies excited by cathode ray radiation compares favourably with that of incandescent illuminants. In the case of the special preparation "Z.23" mentioned above, the efficiency is about 1.85 candles per watt of energy input. In a television transmitting tube the brightness of the scanning spot (about 0.3 mm. in diameter) is 17 candles per sq. mm., as compared with 5 to 13 candles per sq. mm. in the case of the filament of the gasfilled lamp. The maximum amount of light available is 4 to 5 per cent. of the energy input.

*"Light and Lighting," February, 1936, p. 48.

Analysis by Fluorescence

Useful data on the Testing of Materials by Fluorescence has been contributed by J. A. Radley in an article in the "Electrical Times" (February 13, 1936). In addition to the special applications illustrated at the recent meeting of the Illuminating Engineering Society, fluorescence by ultra-violet rays may be exploited in the study of different qualities of paper, oils, bitumens, and synthetic resins of various kinds. Chinese wax can thus be differentiated from Japanese wax, and the amount of tar in bitumen even estimated numerically.

Yet another application is to the testing of glaze on porcelain, an idea of special interest in connection with electrical insulators, for high tension circuits. By this means, it is believed, slight defects in the surface, which might lead to ultimate breakdowns, may be detected.

The crossing of Priory Road and the Broadway, two principal roads on the Priory Estate, Dudley, where up-to-date gas lighting has been installed. The types of lamp used are six-light Rochester lamps with dual clock control, four mantles being extinguished at midnight, and the remainder one hour before sunrise. On the main roads themselves the lamps are staggered 50 yards from pole to pole on the diagonal measurement, 20 ft. above ground level.

Improved Public Lighting

Does It *Always* Reduce Accidents?

Public lighting figured prominently in the discussion in the House of Commons on road accidents last month. Mr. Salt quoted extensively from data collected by the National Safety First Association and figures presented before the Public Works and Transport Congress last year. Such data have been very fully analysed in this journal. It was shown that (a) the proportion of accidents occurring by night increases year by year; and (b) this proportion is unduly high considering the relatively smaller volume of traffic, both vehicular and pedestrian by night.

In using these facts as an argument for better lighting Mr. Salt was on firm ground. One sympathises with his advice to the Ministry to conduct a "major experiment" by lighting adequately the whole of the road from London to Birmingham (or, if the expense be too great, from London to St. Albans).

Arguing from experience on a small scale on the Victoria Embankment, Mr. Salt inferred that such an experiment would lead to a marked diminution in accidents. But *would it*? And if no reduction in accidents could be traced, ought the improved lighting to be condemned as valueless?

It must always be remembered that the first effect of better lighting is to swell the volume of traffic and encourage an increase in speed—both conditions that are liable to lead to *more* accidents, unless accompanied by discretion on the part of drivers.

This does not mean that better lighting does not, on the whole, tend to make the roads safer. It does —if only by partially removing an obvious handicap in the driver's skill. But if its value is to be judged in terms of the number of accidents *all* the relevant factors must be very carefully studied.

Rochester 5-light lamps, clock-controlled, have been installed in the main thoroughfares of Whitley and Monkseaton. Tubular steel posts with bracket arms are used so that the lamps project 3 ft. 3 inches at a height of 17 ft. 6 inches over the carriageway. They are placed in pairs opposite each other and with 120 ft. between each pair. One lamp in each pair is extinguished at midnight. The lamps are fitted with Holophane prismatic band and dish refractors.

ARCHITECTURAL LIGHTING OF TO-DAY

What is known as "architectural lighting" is now firmly established, and many good examples can be quoted. In some cases the method consists simply in lighting from concealed sources, artfully disposed. The appended view of the reading room of the Cambridge Library illustrates this device. The lighting indirect is done from the top of the bookshelves (an idea that is becoming quite usual in libraries) and shows off the architectural feature of the room to advantage, at the same time affording ample illumination both on the horizontal surfaces of tables and on the vertical surfaces of shelves. The absence of apparent shadow and the freedom from troublesome glare from the more or less shiny pages of books which this mode of lighting confers render it especially suitable for library lighting.

The Reading Room: Cambridge Library.
Architect: Sir Giles Gilbert Scott, P.P.R.I.B.A.

The staircase of Heal and Son, illustrated below, shows the adaptability of architectural tubular lamps which in this case were installed on the soffit of the stairs directly under each tread, the holders being let into recesses cut in the concrete at the time of building. There is no visible wiring. The lamps are so connected that they may be used alternately. Apart from their decorative effect, these lamps form the sole method of lighting the stairs.

The third illustration (Bentall's Departmental Stores) shows the combination of the central "sunlike" fitting with a flashed opal glass beam equipped with 60-watt lamps and stretching from side to side of the semi-circular hall. Built in medallions add an interesting decorative element to the walls above the showcases and help to complete the general design.

These form three amongst many effective illustrations in the recently issued "Electric Illumination Handbook" (No. 8B) issued by the E.L.M.A. Lighting Service Bureau; data on the spacing of lamps behind frosted and flashed opal glass and other useful hints are also given.

The Staircase of Heal & Son (Tottenham Court Rd., London)
Architects: Smith & Brewer.

Main Entrance to Bentall's Departmental Store (Kingston-on-Thames)
Architects: Sir Aston Webb & Son, FF.R.I.B.A.

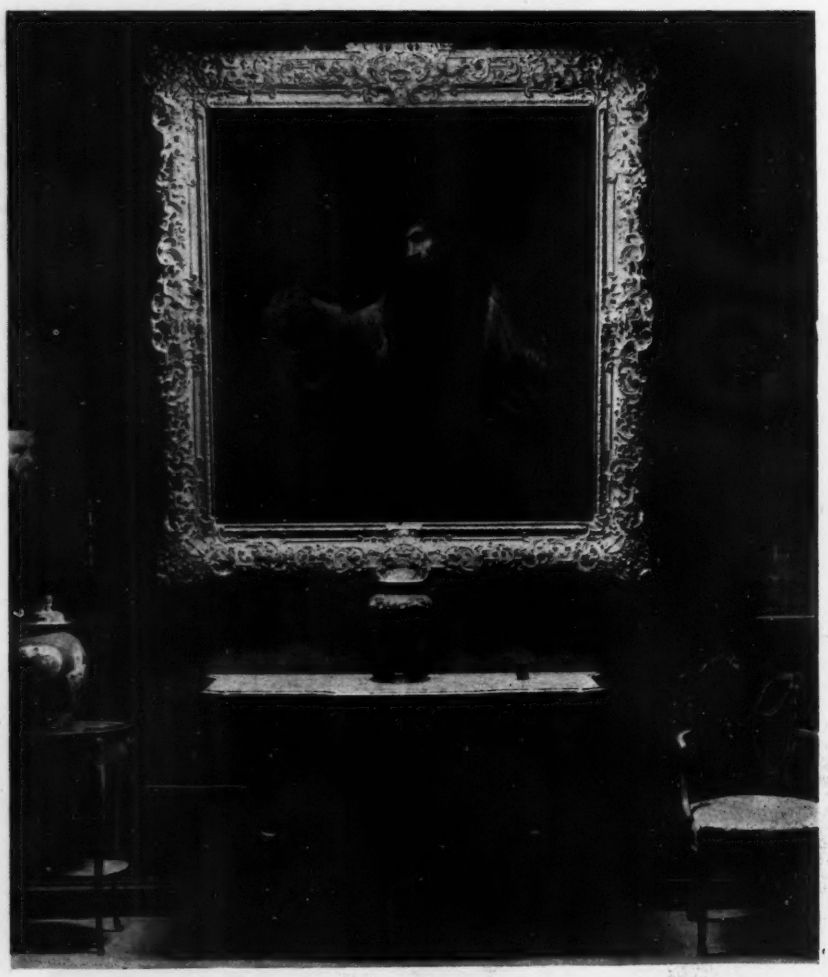
PICTURE LIGHTING

A Neglected Aspect of Interior Illumination — Specialisation Essential—A System Applicable to Individual Pictures and Art Galleries.

ONE of the most neglected aspects of interior illumination must surely be the lighting of pictures, for over and over again one finds people who, having spent considerable sums of money on the purchase of pictures, are unable to view them properly in their own homes owing to bad light.

The badly lighted wall surfaces of the average house are partly to blame, but even when there is an abundance of natural daylight it may be too hard for the subject. Difficulties also crop up through reflections from windows, mirrors, etc. These daytime problems can be sometimes overcome, but when night falls and the ordinary artificial room lighting comes into use, pictures carefully placed for daylight observation become invisible, or nearly so. Uninformed attempts to eliminate this fading-out often take the form of strong and unsuitable concentrations of light which usually ruin the artistic value of pictures within their range. Faults such as undue concentration of light at the top of a picture, patchy illumination, and glare are typical of the results obtained by the use of ill-designed picture-lighting equipment. Direct light on a picture destroys true colour tones and perspective, and exerts a flattening effect on the whole composition. Then over-lighting may often prove worse than under-lighting. It may alter the entire character of the picture, as, for example, in the case of landscapes of the early Dutch School whose appeal lies so largely in their delicate atmospheric effects.

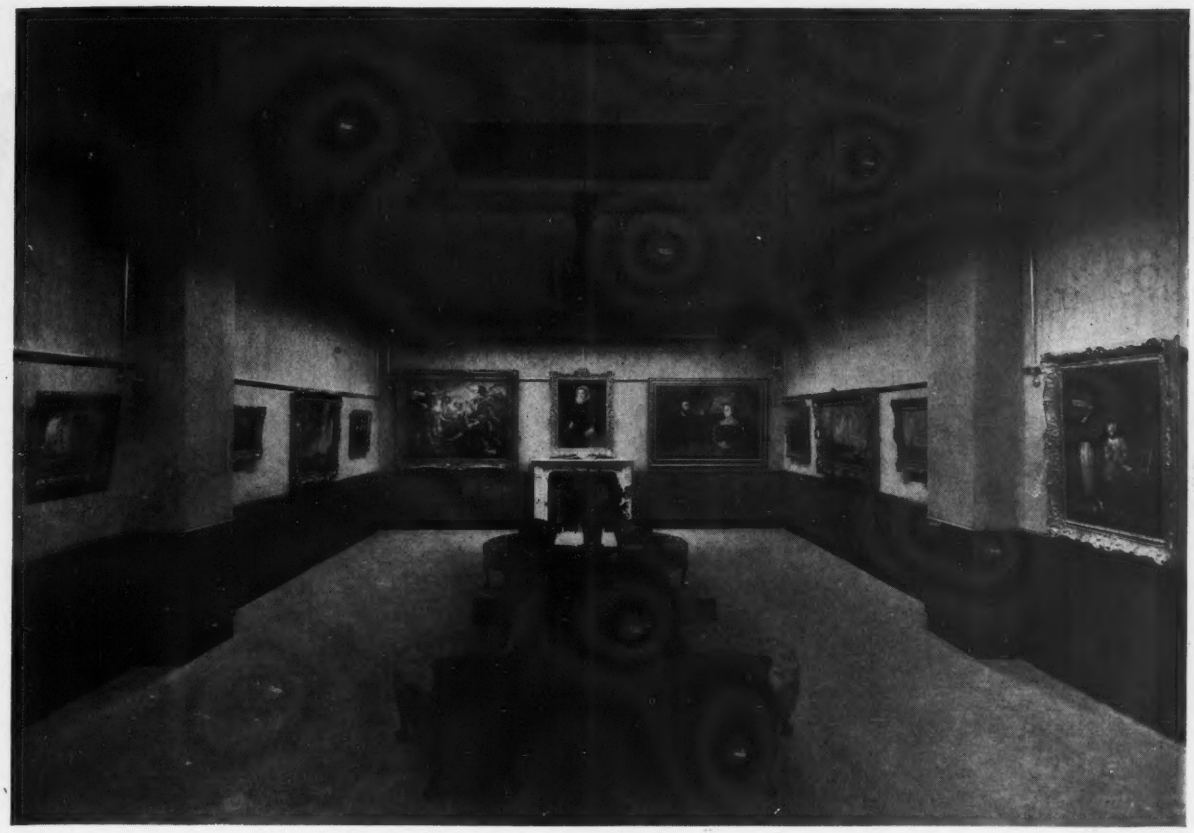
It seems in fact that the satisfactory lighting of pictures is a specialised business requiring, in addition to sound knowledge of illuminating engineering, more than a general acquaintanceship with the style and technique of the various schools of painting; subject, composition, colour scheme and direction of light—all must be taken into consideration. The essentials of good picture lighting may be briefly stated to comprise even light distribution over the whole surface without glare or reflection, and the arrangement of the direction quality and intensity of light to suit the particular requirements of individual subjects.



The world-famous Rembrandt "Aristotle," lighted by the "Whiteway" System at the Art Treasures Exhibition at Christies. This photograph was taken by a time exposure, with the room in complete darkness except for the picture lighting.

A neat and unobtrusive fitting known as the "Whiteway" reflector, introduced by W. R. White and Company, has been designed to provide the correct illumination for pictures of any size. In this fitting a parabolic reflector is used in combination with a glass diffusing screen set at right angles to the surface of the picture so that light is thrown downwards past the picture, and not directly on to it. The diffusing screen slides into special grooves, and one end of the reflector is fitted with a removable cap to permit its withdrawal for the replacement of lamps; it is shielded from the eye by an extension of the front edge of the reflector. The construction allows for adjustment in three planes, through the use of a telescopic carrying arm secured to the reflector by a friction joint with butterfly nut, and to the back-plate by a worm and thread for raising or lowering. These devices permit very easy and accurate adjustment to meet the varying requirements of picture area, width of frame, and height on the wall.

The accompanying illustrations give some idea of the effectiveness of the system of lighting as applied to individual pictures. The illustration on page 117 shows the lighting of a well-known London art gallery by special reflectors of similar type suspended by chains from the ceiling. In low-ceilinged galleries the reflectors are fitted into and concealed by a cornice.



This illustration shows the excellent illumination provided in a well-known London art gallery by means of "Whiteway" lighting (*see article on page 116*). In this lofty room the reflectors are suspended by chains from the ceiling. In low-ceilinged rooms the reflectors are fitted into, and efficiently concealed by, a cornice on the ceiling.

Too Bright Lighting?

Our attention has been drawn to a note in the "Warwick County News" recording the plea of a cyclist. who was summoned at the Sutton Coldfield Police Court for having no light. His defence was that the lighting on the Birmingham Road was so bright that it was difficult to tell whether the lamp was on or off!

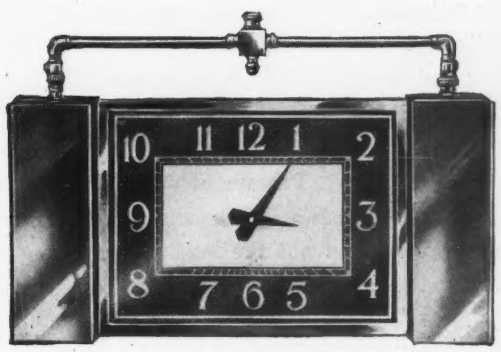
Messrs. Simplex Electric Company, Ltd., who send us the illustration of the road, here reproduced, mention that it is lighted with centrally suspended

Simplex Refractor lanterns equipped with 500-watt lamps. Similar lanterns are used in the centre of the town.

This stretch of road, about four to five miles, is considered exceptionally well lighted. One doubts, however, whether this excuse for omitting to exhibit vehicle lights can be seriously entertained—though certainly such conditions should render unnecessary the powerful headlights that motorists so often display.

A Gas-Lighted Clock

We reproduce below an ingenious novelty exhibited at the British Ideal Home Exhibition, a product of Falk Stadelmann and Company, Ltd. This Veritas Internalite Gas clock is fully illuminated by the two adjacent gas burners. The panel is 12¾" by 9", the metal work chromium plated, and the movement a British 8-day one. A gas switch complete with domed hand control (either tumbler or rotary pattern) is provided, and a gas cock with special by-pass connections.



Other gas lighting fittings of an "architectural" type were also on view. Special mention may be made of the translucent sphere surrounded by a clear glass ring (after the manner of the planet Saturn)—a form which has recently proved popular for electric lighting fittings.

Messrs. Falk Stadelmann were also responsible for a good display of electric fittings. We hope to illustrate some of the most original of these in a subsequent issue.

A pleasing picture of Lighting in a Liverpool store.

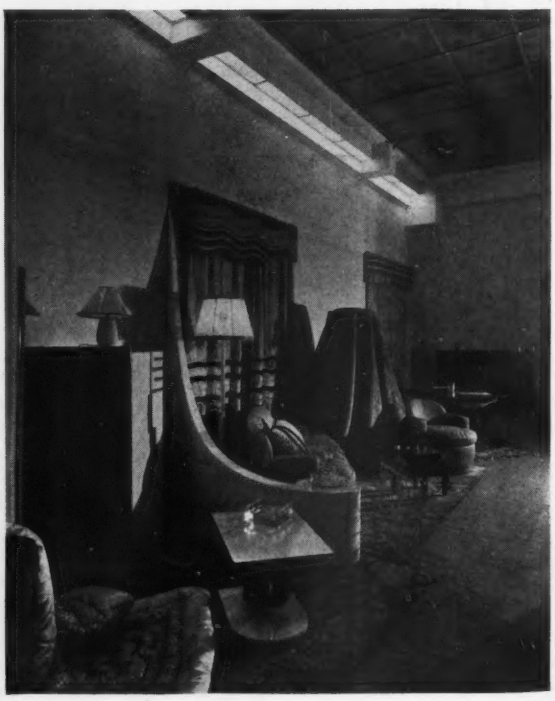
Architect: Mr. Dudley Nisbett, F.R.I.B.A.

Modern Store Lighting

The adjacent attractive pictures, showing the illumination of a Liverpool store by means of G.V.D. ceiling and cornice units, illustrate methods that are becoming usual in modern stores. Boxed in units and cornice designs are replacing the chandeliers of the past. The unobtrusive effect of such methods is ideal in the store where the illuminated goods on view and not the means of lighting them should be the things that are the centre of attraction!

The aim in such cases is to produce even diffusion of light and soft shadows. Occasional portable lamps and standards such as those here seen often help to round off the general effect.

The ceiling fitting visible in the upper illustration measures 5 ft. by 2 ft., and carries one 500-watt lamp. For the cornice units 60-watt lamps at intervals of three feet are used.



Another view: The standard unit fits in well with the general diffused illumination.

The Council Chamber at the Swansea Civic Centre.
Architects: Messrs. Ivor Jones and Percy Thomas.

The Royal Masonic Hospital, Ravenscourt Park, London.
Architects: Sir John Burnet, Tait & Lorne.

LIGHTING FITTINGS OF DISTINCTION

Although the style of lighting fittings has changed so much of late they may still serve—perhaps more than ever—as striking elements in the general architectural design.

Here are three views of recent installations. In all three cases the fittings, furnished by The Lighting Centre, Ltd., have much to do with the pleasing effect of the picture.

The large pendant fittings in the Council Chamber at the Swansea Civic Centre form imposing decorative objects. Each of the cylinders on the outer ring of the fittings has its own lamp. The fittings are lowered on winches for cleaning and replacement of lamps.

On the landing of the Royal Masonic Hospital two urns of light are seen. These are of specially blown creamy glass shapes, the concave sides of which are illuminated.

The ceiling fittings in use in Messrs. Stewart and Ardern's Service Station at Ilford house 500-watt lamps in conical sheet metal reflectors. Access to the lamp is obtained by sliding a small circular glass disc, which covers the hole in the large circular glass plate.

Stewart & Ardern's Service Station, Ilford.
Architect: Mr. S. Cameron Kirby, A.R.I.B.A.

National Illumination Committee of Great Britain

(Affiliated to the International Commission on Illumination)

Annual Report for the Year 1935

Presented at the Annual Special Meeting of the Committee on Thursday, February 27th, 1936.

THE work of the Committee during the past year has been concerned mainly with the preparations for the Plenary Meeting of the International Commission on Illumination which was held in Germany at the beginning of July last. Each of the British sub-committees made contributions to its particular subject. On the four subjects for which the British National Committee had accepted the secretariat responsibility, Glare, Aviation Lighting, Traffic Control Signs, and Mine Lighting, comprehensive reports were prepared which incorporated contributions from foreign national committees.

The British delegation to the meetings of the International Commission on Illumination was particularly strong, and consisted of fifty-three delegates, of whom eighteen were members of the National Committee. This is by far the largest delegation which the Committee has ever sent abroad and, apart from the German delegation, was the largest which attended the meetings. In all, about 300 delegates attended from countries other than Germany, and all the member countries of the Commission except the Argentine were represented. Spain was admitted to membership. The U.S.S.R. having applied for membership sent observers, and has now been accepted as a member of the Commission, which now claims the adherence of seventeen countries.

In addition to three general sessions, twenty-seven meetings of the various technical committees of the Commission were held. Both at Berlin and Karlsruhe the arrangements for this large number of meetings were excellent in all respects. In Berlin one floor of the Reichstag was placed at the disposal of the Commission, and at Karlsruhe the new students' institute of the Technical High School. The welcome of the German hosts was particularly gratifying, and the arrangements made called forth many expressions of pleasure and admiration.

It is not possible in this report to indicate the scope of the work accomplished as a result of this ninth Plenary Meeting of the Commission. A very useful summary of the proceedings was given in the "Illuminating Engineer" for September, 1935. Progress was perhaps most noticeable in connection with the subject of Aviation Lighting and Aircraft Lighting, which had been the subjects of a special meeting held at Zurich in 1932, that is, since the last Plenary Meeting of the Commission.

As is usual at these meetings, the secretariat responsibility for various subjects was reviewed, and some changes made. A few subjects, such as coloured glasses for signal purposes and colorimetry, were regarded as not requiring further special study at the moment, and have temporarily been omitted from the list of the Commission's most immediate interests. The four photometric subjects were grouped into two, the one dealing with visual photometry and the other with physical photometry. A new committee dealing with light sources was also formed.

The list of subjects now under study, together with the name of the country which is accepting secretariat responsibility, is given in the table below:—

Subject.	Secretariat.
Vocabulary	Switzerland
Definitions and Symbols ...	France
Units and Standards of Light	Central Bureau
Glare	Great Britain
Photometry (Visual)	Hungary
Photometry (Physical) ...	Poland
Diffusing Materials	Czecho-Slovakia
Street Lighting	Great Britain
Automobile Lights	Belgium
Applied Lighting	U.S.A.
Architectural Lighting ...	Spain
Aviation (Ground) Lighting...	Holland
Aviation (Aircraft) Lighting...	France
Traffic Signals	Sweden
Shadows	Austria
Mine Lighting	Germany.
Ultra-Violet Light	Holland
Lighting Education	U.S.A.
Voltage Fluctuations	Italy
Light Sources	Germany.

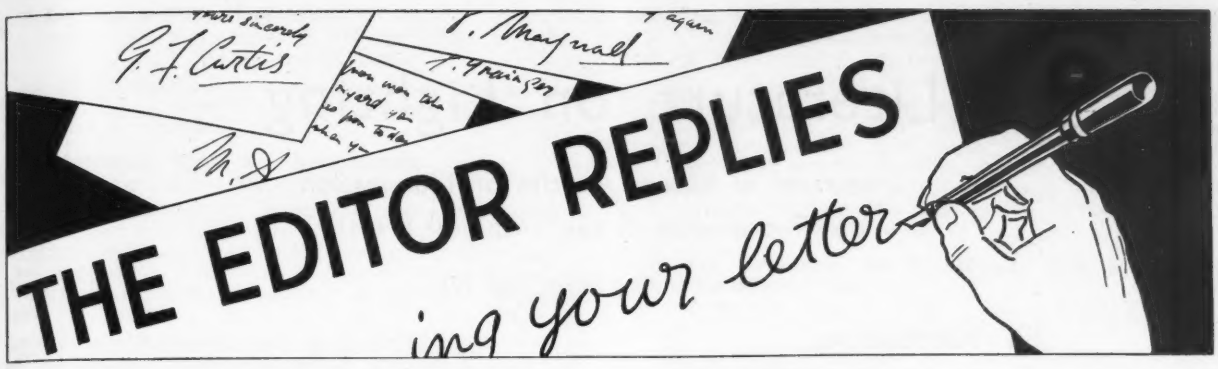
It will be noted that Great Britain still retains the secretariat responsibility for Glare and that it has now assumed responsibility for Street Lighting.

Professor Fabry (France) was unanimously invited to become the new president for the next three years in succession to Dr. Meyer (Germany). Dr. N. A. Halbertsma (Holland) continues as a vice-president, while Messrs. L. V. Rihanek (Czecho-Slovakia) and O. de Bast (Belgium) were elected to the two vice-presidential vacancies. Mr. C. C. Paterson was re-appointed honorary secretary and Mr. A. Filliol honorary treasurer.

The committee has to report several changes in its membership during the past year. Mr. Copp, representing the Institution of Gas Engineers, has resigned, and has been replaced by Mr. Stephen Lacey. Mr. J. M. G. Trezise, who has been a member of the committee since 1924, has had to resign through ill health, and has been replaced by Mr. J. W. T. Townley as a representative of the Institution of Electrical Engineers. Dr. S. English has replaced Miss Haslett as a representative of the Illuminating Engineering Society, Mr. E. E. Hoadley replaces Mr. G. Porter as the representative of the Incorporated Municipal Electrical Association. Major Gunton, who has actively represented the General Post Office since 1927, resigned owing to his retirement from the Post Office, and has been replaced by Captain H. B. Cresswell. Finally, the committee regretfully reports the death of Major G. H. Spittle, who had represented the Railway Clearing House since 1926. Major Spittle had been a very active worker, not only on the committee and its sub-committees, but at the meetings of the International Commission on Illumination in America, Great Britain, and Germany, and his death is a great loss to the committee.

The committee again has pleasure in recording its indebtedness to the Institution of Gas Engineers, the Institution of Electrical Engineers, and the Illuminating Engineering Society for the financial assistance which makes possible the co-operation of the committee in the work of the International Commission on Illumination; and also for their hospitality in allowing the committee to meet in their rooms. They wish also to take the opportunity of thanking all those gentlemen and organisations, and in particular the National Physical Laboratory and the British Standards Institution, that have continued to assist the committee in its technical work.

K. EDGCUMBE, Chairman.
H. BUCKLEY, Hon. Secretary.



I want to know . . . . . .
. . . . . I'll tell the World.

There are evidently a great many more public lighting **installations of sodium electric discharge lamps** than we imagined. Our comment on this point has brought us letters from half a dozen correspondents, several of whom mention lists of installations in the North and Midlands. Some of our correspondents confirm our statement that Aylesbury is a good example. Amongst other cities mentioned as having installations are Liverpool, Rochdale, Bolton, Mellor, Oldham, Salford, Stretford, and Warrington. Mr. Sellars tells us that in Liverpool, under his direction as public lighting engineer, there are about 400 of these lamps in use, and in Rochdale 300. There should, therefore, be no difficulty in getting experience of their use on a large scale. Considering how widely the lamps are coming into use, it is surprising what little publicity has been given to them.

Mr. Leslie Robertson, the honorary technical secretary of the Victoria division of the **Illuminating Engineering Society in Australia,** points out that the note in our January issue referred only to the New South Wales Section. The existence of these two organisations—necessitated by the vast distances between centres in Australia—is liable to be overlooked in this country. These two sections, with headquarters respectively in Sydney and Melbourne, are both doing excellent work. If both sections are considered, there is a total membership of 214—a creditable figure considering the local circumstances and the fact that these are amongst the youngest of the illuminating engineering societies.

A reader has asked us to recommend a good **book on electric discharge lamps and mercury lamps.** We confess this finds us at a loss—we cannot recall any books exclusively devoted to these lamps, though some will doubtless make their appearance shortly. Changes in this field are so rapid, however, that such books are liable to become out of date very soon!

The fact that readings with **photo-electric photometers** require correction when different spectra are compared is now familiar, and in one type (the "auto-photometer") a device enabling a correction to be applied automatically is embodied. Our attention has been drawn to one rather curious point—the application of such factors in the case of **composite units,** in which both filament and electric discharge lamps are incorporated.

When such lamps are mounted within a diffusing envelope an average of the factors corresponding to the two types might be applied. In the case of some forms of units, however, such as, presumably, the new "dual" Sieray lamps, one might get, at certain angles, light which is mainly from the filament, and, at others, light chiefly derived from the luminous tube mercury tube—so that, strictly speaking, the factor would vary according to the angle at which light was received. This certainly complicates the taking of polar curves, but a little ingenuity should enable a fairly accurate correction to be applied.

Our attention has also been drawn to a letter in the Press complaining that the light from **mercury vapour lamps** is prejudicial to the appearance of **coloured posters**—some hues being "drowned" and others over-emphasised. Sad, but true. One can only suggest that publicity agents who seriously consider the effect of their posters by night ought not to rely on the gratuitous illumination from public lamps, feeble at best, but to provide adequate local lighting suited to their needs. If this is done, the effect of any casual light from public lamps should be negligible.

We have had some inquiries about the **"Floodlighting Toy"** described in our February issue (p. 63). We understand that the store responsible for this was Gamages—certainly an enterprising Christmas novelty!

We have been asked whether it is likely, in the immediate future, that **films** will be shown **displaying** objects not only in their **natural colour,** but apparently as **solid objects in space.** So far as colour values are concerned, we are given to understand that, in a technical sense, the problem might almost be regarded as solved, though the commercial aspect is less fully developed. One difficulty, apparently, is the duplication of such films in a sufficiently rapid and inexpensive manner.

As regards giving apparent solidity to objects on the screen, we are less sanguine. A good many years ago an experimental device based on the reception of the luminous image on a series of network screens, instead of an opaque one, was shown at the Scala Theatre. The effect was promising, though the moving figures had a ghostly rather than a realistic effect.

Another method of producing the stereoscopic effect involves providing each member of the audience with a pair of spectacles containing red and green glasses, projection of the picture in the two colours at suitable angles being also employed. This is said to be very impressive. We recall that the effect of a somewhat similar device included in the programme at the Egyptian Hall some years ago was quite disconcertingly so! But this hardly seems an ideal solution.

A correspondent sends us an amusing Press cutting relating to the **lighting of the House of Commons.** In reply to a recent inquiry, the First Commissioner of Works is reported to have stated that about 75 per cent. of the electric lamps in the House were of the gas-filled type. He was, however, not in a position to forecast the date by which this type only would be in general use—as substitution of gas-filled lamps, where available, took place as the old types wore out!

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from March, Page 85)

II.—PHOTOMETRY.

82. Observations on the Properties of Selenium Photo-electric cells.

G. Marchal and L. Marton. Rev. d'Opt., Vol. 15, No. 1, pp. 1-11, January, 1936.

The illumination-response of selenium cells has been investigated, spectral sensitivity curves obtained, and the fatigue effects of the cells measured. R. G. H.

83. Selenium Cell for Measuring Solar Radiation in the Far Ultra-violet.

R. Latarjet and G. Liandrat. Rev. d'Opt., Vol. 14, No. 12, pp. 443-448, December, 1936.

Describes, with diagrams, a special form of photo-electric cell. The spectral sensitivity curve of the cell is given, together with the transmission characteristics of the filter used in conjunction with the cell. R. G. H.

III.—SOURCES OF LIGHT.

84. The "Super-aga" Tungsten Filament Lamp.

H. Pécheux. R.G.E., Vol. 38, No. 24, pp. 803-808, December 14, 1935.

Considers the light distribution of the "coiled-coil" type lamp. W. R. S.

85. Mercury Vapour Lamp.

Anon. El. World, 106, p. 670, February 29, 1936.

Some details, and a photograph, are given of the American 250 watt mercury vapour discharge lamp. This differs in many details from the English type of lamp of this wattage, notably in that it has only a single glass bulb, and may be burned in any position, but runs at a considerably lower efficiency. S. S. B.

86. Horizontal Discharge Lamps.

R. Maxted. El. Review, CXVIII., p. 309, February 28, 1936.

A discussion of the various possible circuits for magnetic control of H.P.M.V. discharge lamps when burned horizontally, with their advantages and disadvantages. J. M. W.

87. The Water-cooled, Super High-pressure, Mercury-Vapour Lamp.

W. Elenbaas. Zeits. f. Techn. Physik, 17, 2, p. 61, 1936.

A short account of this lamp, mentioning some theoretical considerations and practical results. W. R. S.

IV.—LIGHTING EQUIPMENT.

88. The Transmission of Light through Window Glass.

Illumination Research. Technical Paper No. 18, issued by the Department of Scientific and Industrial Research, 1936.

The transmission factors of forty-nine different kinds of window glass have been measured under (i) direct light incident normally; (ii) completely diffused light; and (iii) light restricted to angles of incidence between 45 deg. and 90 deg. Values for normally incident light varied from 92 to 65 per cent.; for obliquely incident diffused light factors fell as low as about 50 per cent. The concealing power of some of the glasses is shown by photographs of a black-and-white chequer pattern placed behind the various samples. Tests show that the loss of transmission due to gradual accumulation of dirt is most rapid for the first three months after cleaning. The rate of dirtying is not appreciably affected by the nature of the glass, so long as rough surfaces are on the inside of the window. J. S. D.

89. Opal Glass and Neon make Effective Sign.

Howard M. Sharp. El. World, 106, p. 496, February 15, 1936.

A box-type of sign, combining filament lamps within the opal glass box and neon discharge tube letters on the exterior, is described. The result is stated to be very effective. S. S. B.

V.—APPLICATIONS OF LIGHT.

90. Progress During 1935.

H. W. Richardson. G.E.C. Journal, VII., pp. 4-5, and pp. 23-32, February, 1936

A detailed record is given of progress during 1935, both in lamp construction and in lighting equipment. Tungsten lamps and hot and cold cathode discharge lamps are dealt with. General lighting schemes, dealing with light sources of all three types, are described with numerous illustrations. Lighting equipment described includes an operating theatre fitting and aerodrome lighting equipment. Thermal problems associated with various fittings are also touched upon. C. A. M.

91. Highway Lighting for Safety.

Anon. El. World, 106, p. 619, February 29, 1936.

A photograph and a brief note is given of an installation of sodium-vapour lamp street lighting in America, which is stated to be the largest such project in the world. It is hoped to test the efficacy of this method in fog and bad weather on this installation. S. S. B.

92. Children Select 20 Foot-Candles.

A. J. Hoffman. El. World, 106, p. 374, February 1, 1936.

As a result of an investigation into the intensity of illumination school children would select for their classrooms, an average illumination of 20 f.c. has been provided in an American elementary school. The lighting is by indirect units, and is controlled photo-electrically. S. S. B.

93. Recessed Coves Improve Lighting.

Anon. El. World, 106, p. 508, February 15, 1936.

The improvement in cove lighting resulting from placing the lamps themselves in a recess, so that direct light is not allowed to fall on the nearer parts of the illuminated surface, is pointed out. A table is given of the average illumination obtained in a typical installation with various types of lamps, coves, and reflecting surfaces. S. S. B.

94. Joseph Rowntree Hall.

Anon. El. Times, 89, p. 174, February 6, 1936.

An account, with photographs, of a small theatre, the lighting of which is claimed to be among the most up to date in the country. W. R. S.

95. Paramount Cinema, London.

Anon. El. Times, 89, p. 253, February 20, 1936.

The cinema is equipped with stage-lighting equipment as well as film projection apparatus. The description includes an account of the auditorium decoration and lighting: photographs are given. W. R. S.

96. Lighting and the Normandie.
Oscar P. Cleaver. El. World, 106, p. 467, February 15, 1936.

A description and several photographs are given of the lighting of some of the public rooms and cabins on the liner Normandie. S. S. B.

97. Illuminated Signs and Architecture.
Signs, pp. 254-259, March, 1936.

The part played by illuminated signs in relation to architecture is illustrated by a number of attractive illustrations, and the views of architects on decorative aspects are expressed. Elsewhere in the issue the permanent display of illuminated signs at Blackpool is illustrated and discussed. J. S. D.

98. French Blend Colours in New Lighting.
A. L. Powell. El. World, 106, p. 644, February 29, 1936.

A description and photographs are given of a number of interior installations in Paris of a decorative nature, utilising discharge tube lighting. Notable in these installations is the use of one neon discharge tube with two mercury vapour discharge tubes with fluorescent coatings, to produce a pinkish white light of very pleasing appearance. S. S. B.

99. Fluorescent and Phosphorescent Materials in Illuminating Engineering.
N. Riehl and P. M. Wolf. Das Licht, pp. 41-45, March, 1936.

The nature of fluorescence and phosphorescence are briefly discussed and their chief applications, for instance, in connection with stage lighting, for use with Röntgen rays and in television are described. The concluding portion of the article discusses the application of luminescent materials with a view to improvements in the mercury vapour lamp. J. S. D.

100. The Sensitivity of the Human Eye to Various Coloured Lights.
H. Schober and H. Jung. Zeits. f. Techn. Physik, 17, 3, pp. 84-93, 1936.

The question of visual response to different coloured lights is discussed in detail, both monochromatic and polychromatic lights receiving attention. W. R. S.

101. Egg Returns Raised with Pen Lighting.
Anon. El. World, 106, p. 364, February 1, 1936.

A report is given of a trial scheme of lighting henhouses during the evening and early morning, thus extending the day. Very satisfactory results are claimed. S. S. B.

Membership in the Illuminating Engineering Society (U.S.A.)

By arrangement the Illuminating Engineering Society in the United States and in Great Britain are simultaneously approaching their own Members and inviting them to take an interest in the sister body.

Those who are familiar with the Transactions of the American Society are aware that they contain much valuable information. Ten issues of the Transactions are made in the course of the year and enable those who receive them to be kept fully informed of progress in Illuminating Engineering in the United States.

Members of the Society of all classes receive the Transactions free, and the receipt of these is alone good value for the annual subscription.

There are three grades of membership, the respective annual subscriptions being as follows:

	*Annual Subscriptions**
Members	$15.00
Associate Members	$ 7.50
Student Members	$ 5.00

We hope that a number of our members will take advantage of this opportunity to become connected with the American Society whose activities are of great interest to Illuminating Engineers in this country.

The attached card, if filled up and forwarded to their Secretary, will receive prompt attention.

A. W. Beuttell (*President*).
J. S. Dow (*Hon. Secretary*).

*These amounts, at the current rates of exchange, are very approximately equivalent to £3, £1.10s., and £1 respectively.

Flashes

A meeting of members of the Illuminating Engineering Society in Dublin will be held on April 23, when Mr. Howard Long is to read a paper on Factory Lighting.

* * *

A course in illuminating engineering, at the Melbourne Technical College is to take place under the auspices of the Illuminating Engineering Society of Australia (Victorian Division) during the forthcoming winter term. A series of twelve lectures, to be undertaken by prominent members of the Society is being arranged, the programme being based on that arranged at the Polytechnic in London in 1933.

* * *

The high pressure gas lighting in Manchester is the largest in the country outside London and consists of 1,000 lamps, some of 1,500 and some of 1,000 candle-power. The special system of "Class A" lighting in St. Peter's Square uses twelve 4,500 candle-power high pressure lamps. There are also 20,250 low pressure gas lamps, and gas is used extensively for the lighting of traffic direction posts and signs.

* * *

Douglas (I. of M.) is preparing a comprehensive scheme of public and decorative lighting.

The Winsford U.D.C. has entered into a further three years contract for the street lighting by gas of the whole of the district. The number of lamps is being increased. A three years agreement for the lighting of the streets in the Fetcham ward has been signed by the Leatherhead U.D.C.

* * *

Twenty-nine 250-watt electric discharge lamps housed in special lanterns are to be erected on the North Circular Road by the Friern Barnet U.D.C.

* * *

When inviting tenders for street lighting in the town of Wicklow during the year 1936-37, the Urban District Council specified that tenders should state the nominal lumen output, the normal recognised life, and the minimum efficiency throughout life, of each lamp proposed. The contract for the lighting, maintenance, and operation of 73/200-watt electric lamps was placed with Electricity Supply Board at a charge of £219 for the year.

* * *

A separate Illumination Department is being set up by the Blackpool Corporation with Mr. F. W. Field as director.

* * *

Complaints have recently been made of the lighting in weaving sheds in Lancashire. Publicity to this matter has been given by the Bursley Weavers Institute.

Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.)

No. 440,579. "Improvements in or Relating to Photometers."

Oldham and Son, Limited, and Holt, H., Junior, October 12, 1934.

This specification describes a photometric arrangement for lamp testing, comprising a cabinet enclosing a photo-electronic cell and a clamping or positioning arrangement adapted to clamp or position lamps of various types, with their centres in the same position relative to the cell. This arrangement is, however, preferably adjustable to permit different relative positions of lamp and cell to be utilised.

No. 440,778. "Improvements in High Temperature Sources of Ultra-Violet Light."

N. V. Philips Gloeilampenfabrieken, May 18, 1934. *(Convention, Germany.)*

According to this specification the envelope of an ultra-violet light producing lamp comprises at least portions of glass substantially free from alkali oxide, consisting of at least 60 per cent of SiO_2, B_2O_3 and A_2O_3, with or without alkaline earth oxide, and having a softening point above 600°C. Formulæ for such glasses transmitting ultra-violet light at high temperatures are given.

No. 440,945. "Improvements in or Relating to Positive Column Electric Discharge Devices."

The British Thomson-Houston Company, Limited, September 20, 1934. *(Convention, U.S.A.)*

This specification covers a positive column tube having a number of widely spaced electron-emissive electrodes with their intermediate discharge gaps in series, and having heating resistances connected in series with one another and respectively in shunt with the discharge gaps.

No. 441,195. "Improvements in and Relating to the Projection of Light."

Martin, H., and Durban, F. E., April 12, 1934.

This specification describes a projector for utilising the light from the craters of arc electrodes oppositely disposed with their axes parallel to the projector axis. The optical system comprises a frontal system, comprising an ellipsoidal, parabolic or like annular reflector or reflectors with or without a central refracting lens, which co-operates with a rear system comprising a semi-spherical reflector having its focus at or near that of the reflector of the frontal system. Both frontal and rear systems permit of the axle arrangement of the electrodes.

No. 441,201. "Improvements in Miners' or the like Safety Lamps."

Hailwood, E. A., June 15, 1934.

This specification relates to safety lamps of the kind in which a lamp bush has a number of air supply openings which are guarded by a ring having a screwed portion which is vertically adjustable for regulating the air supply. The openings are not protected by gauze but the screwed portion of the guard ring has only a small annular clearance from the outside of the fuel vessel or lamp bush so as to provide a long flame-quenching air passage.

No. 441,204. "Improvements in and Relating to Electric Lamps."

Universag Technische, A. G., July 13, 1933. *(Convention, Switzerland).*

This specification describes what purports to be an entirely new method of converting electrical energy into light energy. The electric energy is converted in an accelerating space into kinetic energy of electrons which enter a space containing gases or vapour but free of electric fields and lose their energies, thus ionizing the gas or vapour. The electrons are accelerated by a voltage considerably higher than the cathode drop in an arc discharge preferably between fifty and three hundred volts. The pressure of gas is adjusted so that only a very small number of the primary electrons reach the walls of the vessel without having lost nearly all their kinetic energy. The electronic current is high, for example over half an ampère, so that the electron concentration is very high, for example 10^{11} to 10^{12} per cm.^{3}, in the lighting space. The luminous efficiency is stated to be higher than may be obtained when the current is low, for example a few milliampères. Furthermore, when several gases or vapours are mixed in the vessel they are all excited to produce simultaneously their several spectra so that, by an appropriate mixture, white light may be obtained. In one form of lamp a bulb about 6 cms. in diameter has, fitted in a side tube or neck, a high intensity electron gun comprising a plain cathode of pure tungsten of about 1 cm.^{2} which can be heated to about 2,300° C. The bulb is filled with neon at 0.5 mm. pressure. An electron current of 0.6 ampère accelerated by about 70 volts produces a luminous efficiency of 11 to 12 lumens per watt.

No. 441,319. "Improvements in or Relating to Light Reflectors."

Leray, G., December 21, 1933. *(Convention, France).*

This specification relates to auto-collimating reflectors comprising reflecting surfaces disposed as a tri-rectangular tetrahedron. According to the invention the axis of the tetrahedron, or of each tetrahedron, is oblique to the base thereof in order to increase the effectiveness for obliquely arriving rays. Preferably, where the tetrahedron is of refractive material, its axis is at an angle to its base such that rays incident upon the base at a pre-determined angle are, after refraction, parallel to the axis.

No. 441,985. "Improvements in and Relating to Electric Discharge Lamps."

The British Thomson-Houston Company, Limited, August 10, 1934. *(Convention, Germany).*

In order to maintain the temperature of the walls of the discharge vessels of vapour lamps and so to minimise condensation thereon of the vapour-producing substance, the lamps are made up into a unit comprising several discharge tubes arranged in close proximity to one another, so that portions of each envelope blanket portions of others and electric heating means are located in proximity to, but outside the space between, the envelopes. The heating means may comprise incandescent filament and the whole may be enclosed in an evacuated outer envelope.

Light in Dickens

At a recent meeting of the Dickens Fellowship Council Mr. J. D. Billington, M.I.E.E., M.I.Mech.E., a member of the Fellowship Council, gave an account of lighting in the days of Mr. Pickwick. (Mr. Billington, we may add, with praiseworthy thoroughness, paid us a call in search of historical data on the lighting of that period.)

As the Fellowship is celebrating the centenary of the publication of "Pickwick Papers" at the commencement of the present month, it is opportune to present a few notes on his address kindly furnished by Mr. Billington. Readers may be surprised to find how often mention of light occurs in Dickens.

"The first ray of light which illuminates the gloom." These, the very first words of "Pickwick Papers," seem appropriate for any account of lighting. Curiously enough, the first sentence of chapter II. also mentions light in alluding to "that punctual servant of all work, the sun."

Practically all interior lighting in Pickwick's day was derived from rush lights and candles. The former, often of the home-made variety, were used by the poorer classes down to about the middle of last century. Mr. Billington described the primitive manufacture of these lights, supported by clips and holders and sometimes lighted at both ends. Hence the saying, "Burning the candle at both ends." Candles were responsible for other sayings, such as, "Not fit to hold a candle to" and "The game is not worth the candle."

Rush lights were used for night lights, such as that illustrated in chapter 22 of the "Pickwick Papers," which describes Mr. Pickwick's romantic night adventure. The lady, it will be recalled, "with praiseworthy precaution against fire, had stationed her rush-light in a basin on the floor, where it was glimmering like a gigantic lighthouse in a particularly small piece of water." One of these rush-light shades can be seen to-day at Dickens' house.

Mr. Billington also described the production of tallow candles, which are still being made. He explained that beeswax candles—unlike the ordinary paraffin candles—cannot be made by hand, as they adhere to the moulds, and he recalled the accounts in this journal of the early struggles of the Guilds of Wax and Tallow Chandlers, and of the history of gas and electric lighting. The inauguration of gas supply took place in 1812, the year of the birth of Charles Dickens.

Mr. Billington recalled also the incident in chapter 39, "as to the scientific gentleman, he demonstrated, in a masterly treatise, that these wonderful lights were the effect of electricity." (Lovers of Dickens will not need to be reminded of the real source of these wonderful lights that danced before the learned gentleman's eye, i.e., contact with Sam Weller's fist.)

Well Over 300!

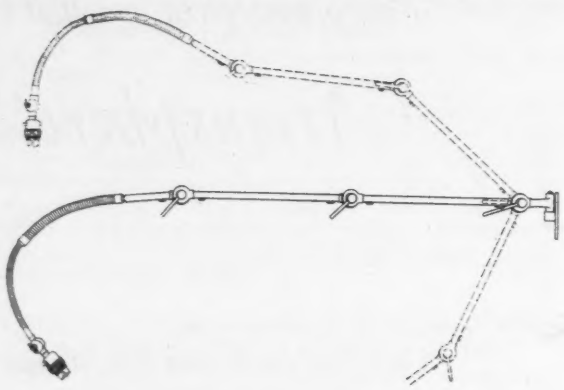
As anticipated, the 300 mark was passed with ease at the annual dinner of the Illuminating Engineering Society on March 24. The attendance was approximately 320 — a record, and far in advance of the number last year. An account of the proceedings will appear in our next issue.

TRADE NOTES AND NEWS

Catalogue of Lighting Accessories

A Typerlite Marvel

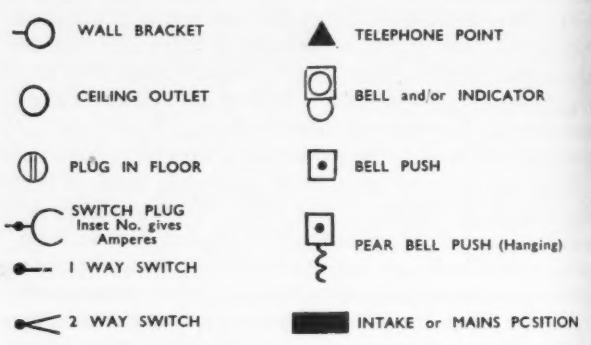
We illustrate below a novel type of detachable swinging all directional wall-bracket introduced by the Typerlite Company. The overall length is 60 in. It is fitted with three special friction joints so that the intervening rods will "stay put" at any desired angle to one another. The end of the bracket nearest



the backplate can be at once detached in one position only from the spindle, round which it can swing for 180°. These special units were supplied to an Electrical Supply Company for illuminating large banks of meters undergoing tests. They should prove exceedingly helpful in all cases where machinery difficult of access needs to be inspected.

A Plan-Marking Set

Consulting engineers and others must often have felt the need for a convenient means of marking in on plans the positions of lighting points, switches, etc. The little set of markers for electrical symbols as standardised by the B.S.I., sent us by Mortimer, Gall and Company, Ltd., and here illustrated, seems



to meet the need very well. The set is supplied in a small box for 3s. 9d. Coloured inks (red for electrical symbols, green for plumbing and sanitary symbols, and blue for hotel furniture symbols) can also be supplied.

An Attractive Showroom

Above appears a photo, taken by the gas lighting of a new showroom of the York Gas Company. Modern types of lighting fittings are on view. The main lighting is by means of bowl lights adapted by the director, Mr. H. E. Bloor.

Kandem Ceiling Fittings

Here are two selected types of compact ceiling fittings which figure in a series listed by Kandem Electrical, Ltd. The same style is followed in bracket fittings, also of very neat design.

We have also before us data on the familiar "Throlite" and "Mirrorlite" lanterns. These have been illustrated in our journal in the past and have proved specially useful for the lighting of streets, docks, and other outside areas.

LIGHT AND LIGHTING

Back Numbers.

Readers are reminded that back copies of this journal, (which until this year appeared under the title of "The Illuminating Engineer") are still available. Lists of individual copies dealing with special subjects will be supplied on demand. Complete sets of twelve issues (unbound with index) can be supplied for 1934 or 1935 at 12/6 for the series, and for the years 1928-1933 at 15/- per series. Special Binding Cases, 4/- each.

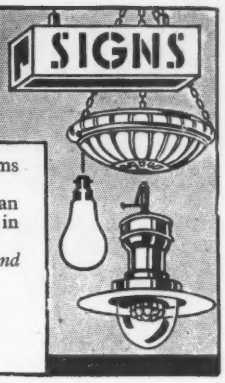
I.E.S. TRANSACTIONS

Loose Leaf Covers.

The Transactions of the Illuminating Engineering Society, containing the full text of papers and discussions, are issued free to all members of the Society, who also receive Loose Leaf Holders on request.

It has now been decided that the subscription for others who desire to receive the Transactions will be 15/- per annum. The cost of Loose Leaf Covers for holding the Transactions is 3/6 (post free).

·WHERE TO BUY·
A DIRECTORY OF LIGHTING EQUIPMENT



We invite applications for spaces in this new section of the journal. Particulars of terms for each space (approx. 1 inch deep and 3½ inches wide) are given below.

These terms are equivalent to **half our ordinary advertising rates,** but not less than 12 successive monthly insertions can be accepted on this basis, and amounts are payable in advance.

Payment for an advertisement in this section entitles the advertiser to receive *Light and Lighting* during the period of the contract.

Terms:	**12**	**Successive Monthly Insertions**	**£3 10 0**	**Payable**
	24	**" " "**	**£6 0 0**	**in**
	36	**" " "**	**£8 10 0**	**Advance**

1

MODERN LIGHTING FITTINGS

New Catalogue on application

Fittings manufactured to Architects' Specifications

ASCOG LIMITED

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for testing candle-power and illumination. Benches, Cubes, Heads, Standards of Light, Special Fittings and Accessories.

ALEXANDER WRIGHT & CO., LTD.,
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ALLOM BROTHERS LTD.

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Specialists in the Science of Modern Lighting, including :

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Decorative Fittings in Glass and Metal.

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Take no risks— specify **BENJAMIN PLANNED LIGHTING**

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Seamless Steel Lighting Standards

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CONCRETE UTILITIES, Ltd.
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DAWSON REFLECTORS

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BI-MULTI AND MULTIPLANE REFLECTORS

Lanterns, Brackets, Columns, Switch and Fuse Boxes, etc., FOR STREET LIGHTING

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Suspension Lamps, Lanterns, **REFLECTORS**
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For Domestic and Artistic Lighting Fittings

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INDUSTRIAL LIGHTING SPECIALISTS

Cast Iron Columns *Street Lanterns*
Fuses *Winches*
Time-Switches *Contact Gears*

ELEC CO. LTD.

ENGINEERING & LIGHTING EQUIPMENT COMPANY LTD.,
ST. ALBANS HERTS.

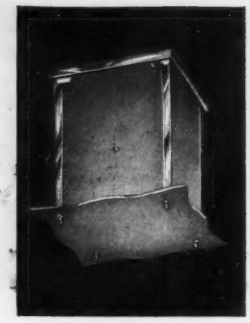
Index to "Where to Buy"

N.B.—The numbers are those attached to individual entries in the Directory (See pp. 129-131.)

An Attractive Range of Units

A novel and attractive range of units—the "Castle" series—has been introduced by the Euston Manufacturing Co., Ltd. Three typical and pleasing designs are illustrated. Fittings can be furnished in orange, gold, crimson, green, pink, and blue. Each model packs into a carton only 1½ in. thick and can be rapidly assembled.

Bracket.

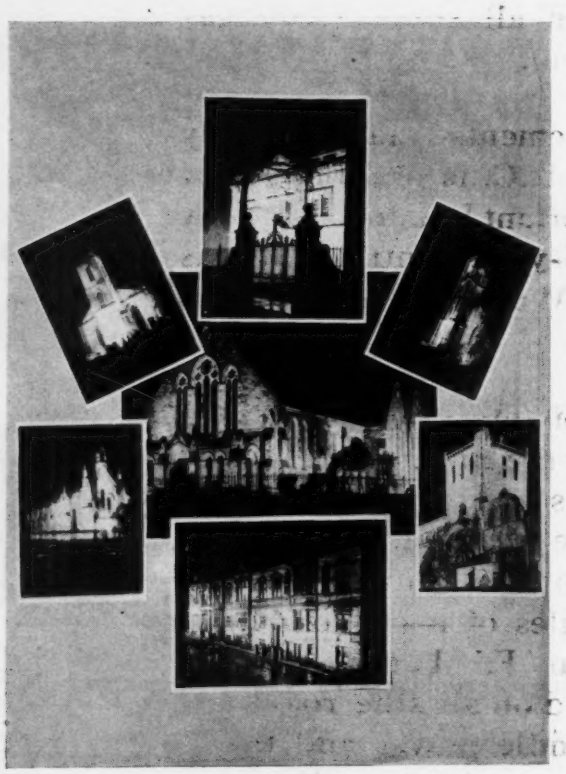


Ceiling.

Pendant.

E.L.M.A. 33rd Illumination Design Course

This coming course takes place during April 27-30. Nearly twenty lectures on practical aspects of electric lighting are to be given, supplemented by evening visits. Any need to predict that it will be quite as popular as its predecessors? No! Those wishing to take part should apply at once to the E.L.M.A. Lighting Service Bureau, 2, Savoy-hill, London, W.C.2.

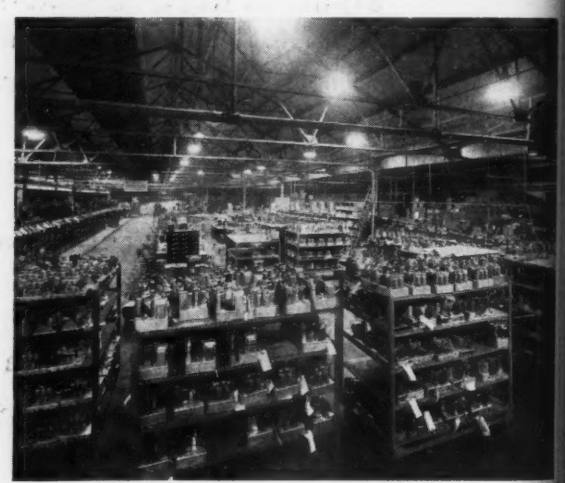


E.L.M.A. Tourist Demonstration Van

This van has just completed a tour of Southern Scotland, occupying three months, in the course of which thirty-seven towns were visited. An enterprising feature was the organisation of advance floodlighting. Above are pictures of some of the installations thus arranged.

Sieray Lamps at Perivale

The picture below shows a view of the new factory of the Philco Radio and Television of Great Britain, Ltd., at Perivale, where over sixty "Sieray" electric discharge lamps have been installed, and are proving very satisfactory—particularly as regards the effect on visual acuity.



Change of Address

The firm of L. J. Beard will in future be known as:—

LEONARD J. BEARD,
Electrical Engineer and Contractor,
Consultant and Modern Lighting Specialist,
524, High-road, Leytonstone, E.11.

The telephone service remains as before (LEYtonstone 3015), and a Night Service has been introduced to operate from LEYtonstone 1203 (after 6 p.m.). The address at Liverpool-road, E.10, will be retained as a sub-office.

The above changes take effect as from March 30, 1936.

Contracts Closed

SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED.

Corporation of Cheltenham.—For the supply of Siemens Electric Lamps during the ensuing twelve months.

NEW GAS LIGHTING CONTRACTS IN LONDON

As evidence of the work that is constantly going on to improve London's street lighting, it may be pointed out that lighting authorities in the Greater London area made no fewer than 16 new contracts during 1935 with one gas undertaking alone. These contracts were for periods varying from five years up to fifteen years, and in most cases specified definite improvements in the lighting installations. In all some 8,000 gas lamps are affected by them.

Among these recent agreements, that made by the Southall-Norwood U.D.C. is of interest, for this makes the fourth important London authority since 1932 to sign a 15-year contract for gas lighting. The others are Westminster, Holborn and Paddington.

Another recent contract of interest is the 5-year agreement entered into by the Brentwood U.D.C. The contract specifies gas entirely. Half a mile of the High Street is to be lighted in accordance with Classification 'D' of the British Standard Specification, and four miles of main roads will comply with Classification 'F.' Lamps on other stretches of main road and on all side roads are to be increased in candle power and the number of lamps employed will be very largely increased.

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